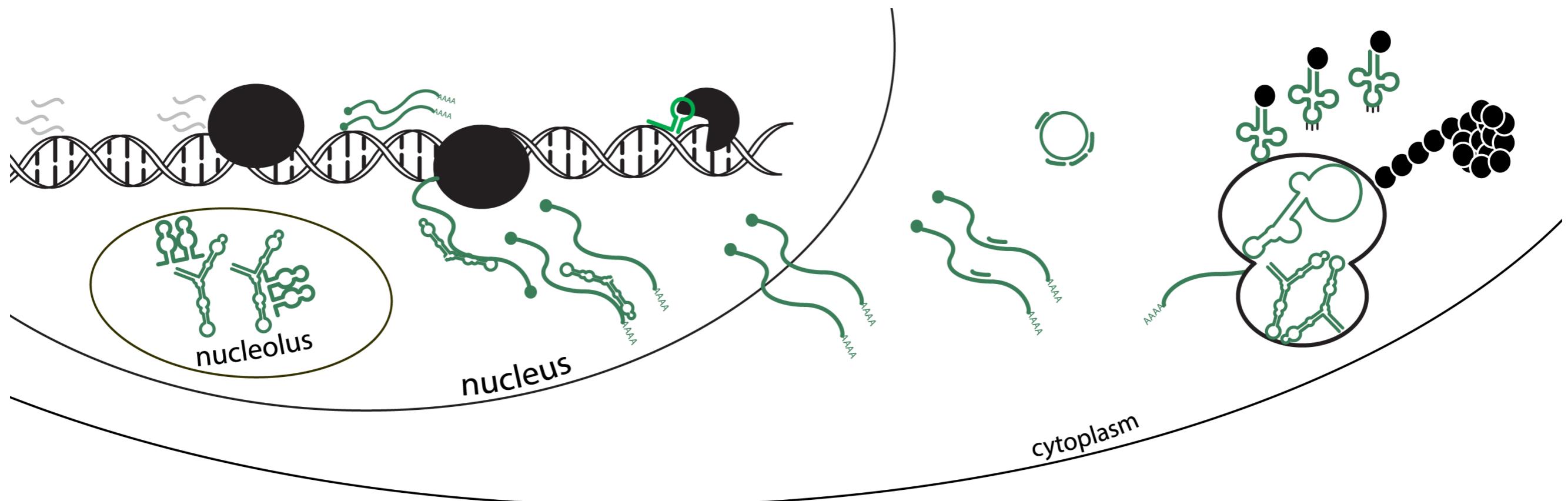
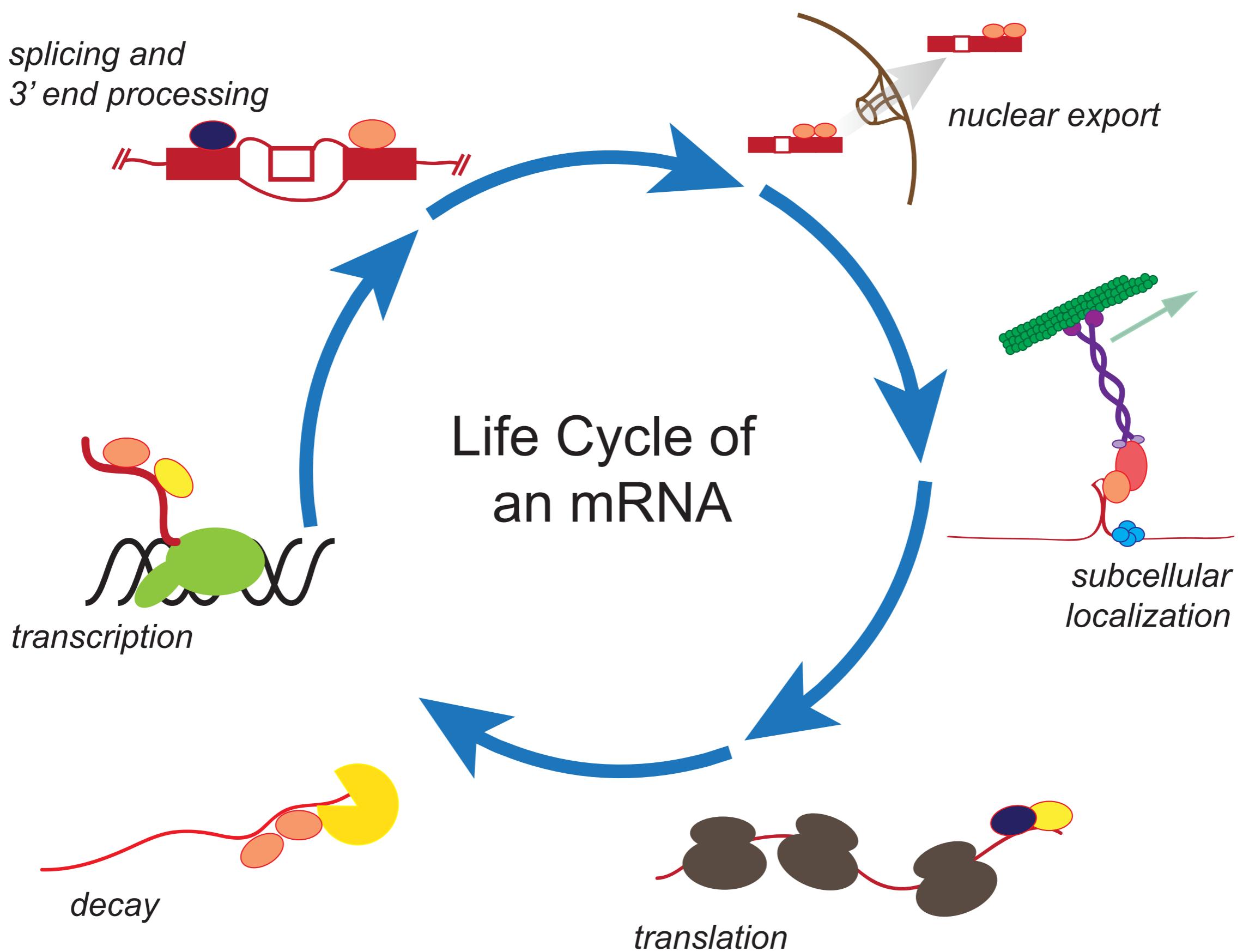


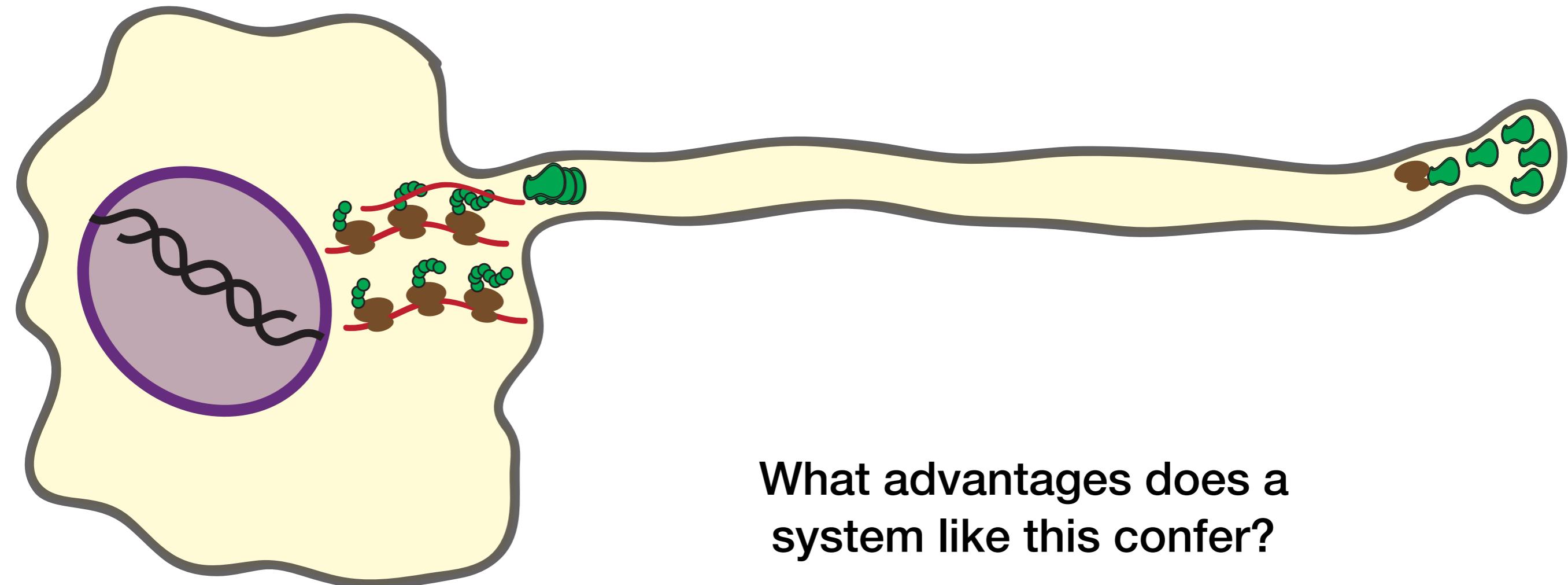
Regulation of gene expression through mRNA localization



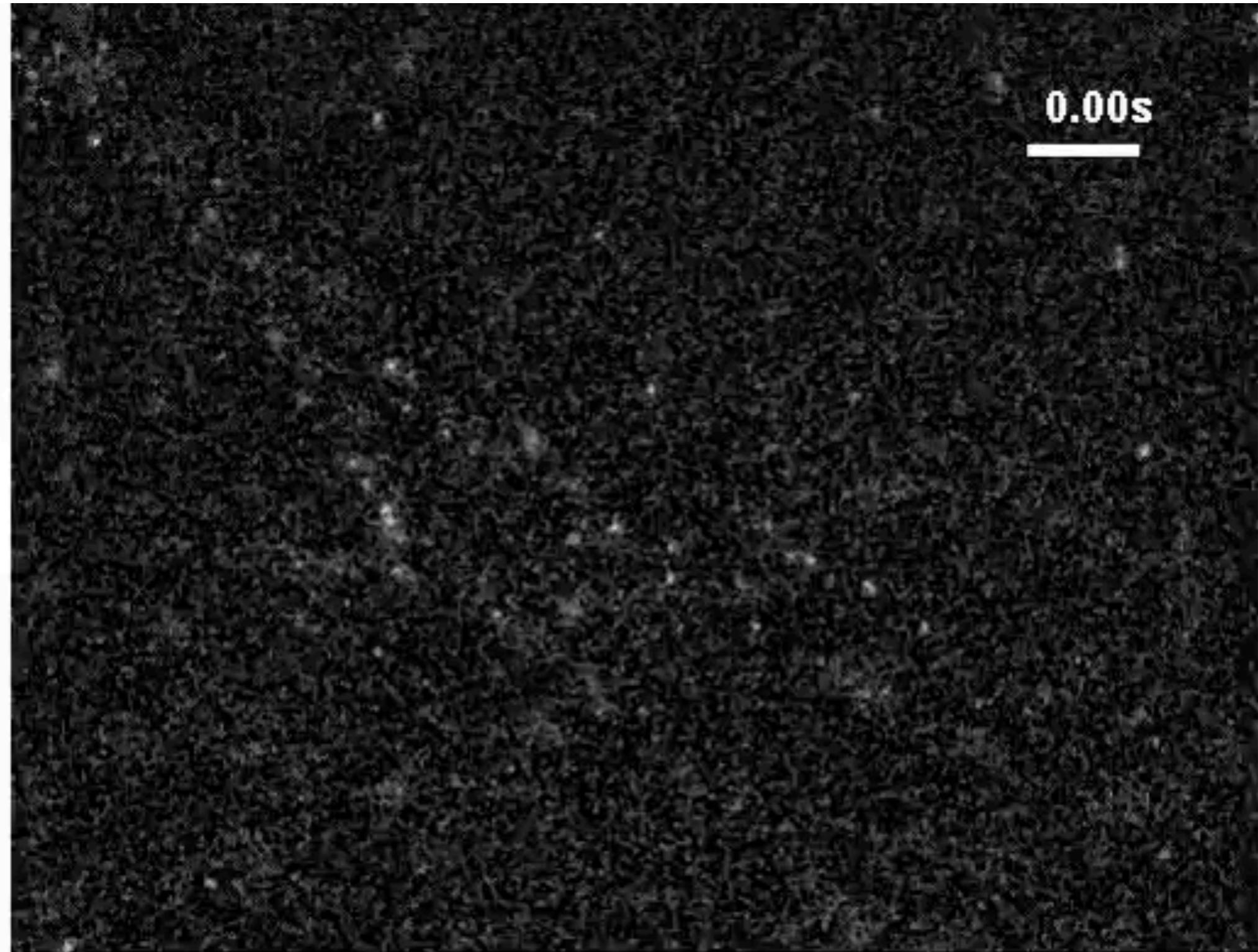
mRNA metabolism is highly regulated



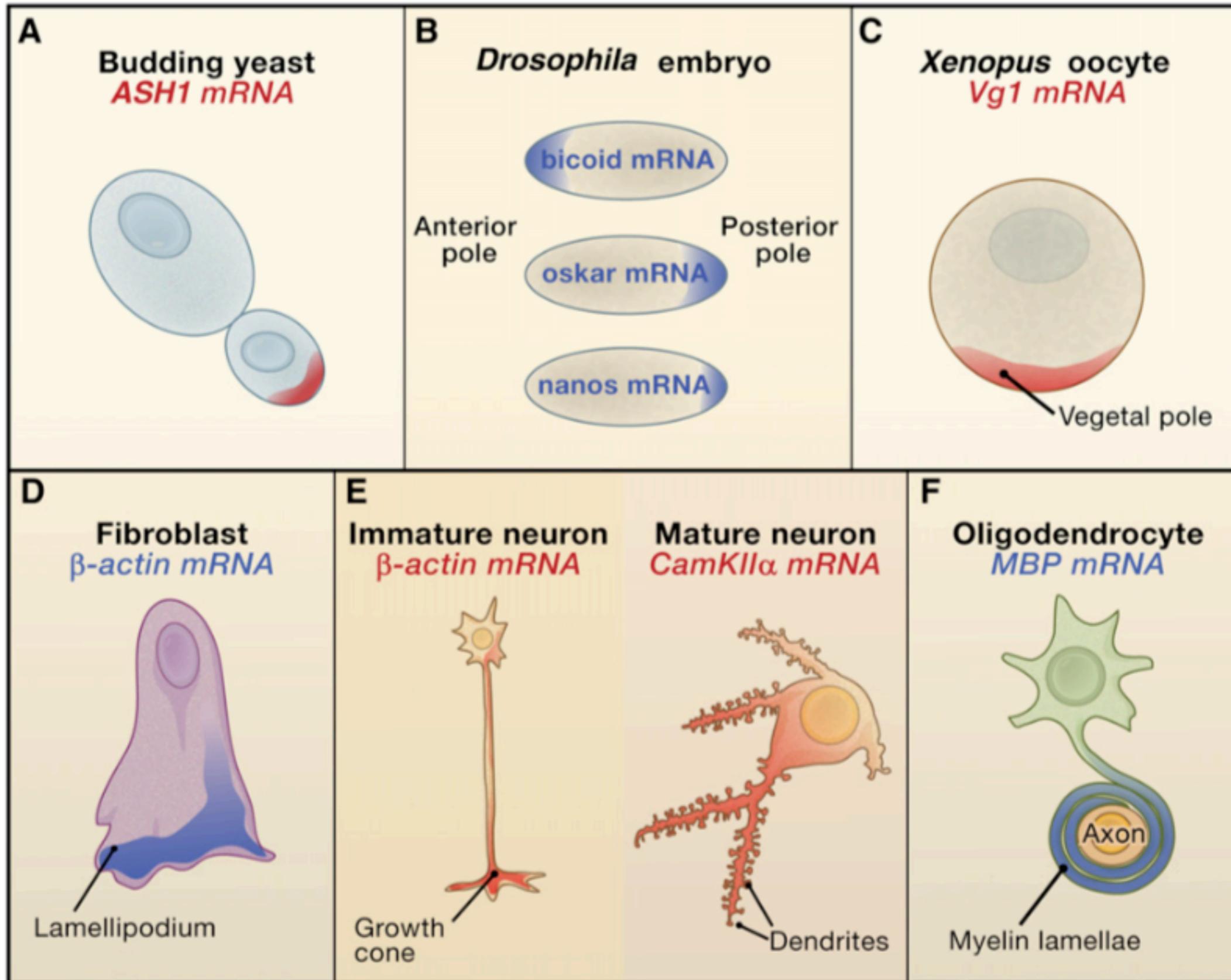
Spatial regulation of gene expression



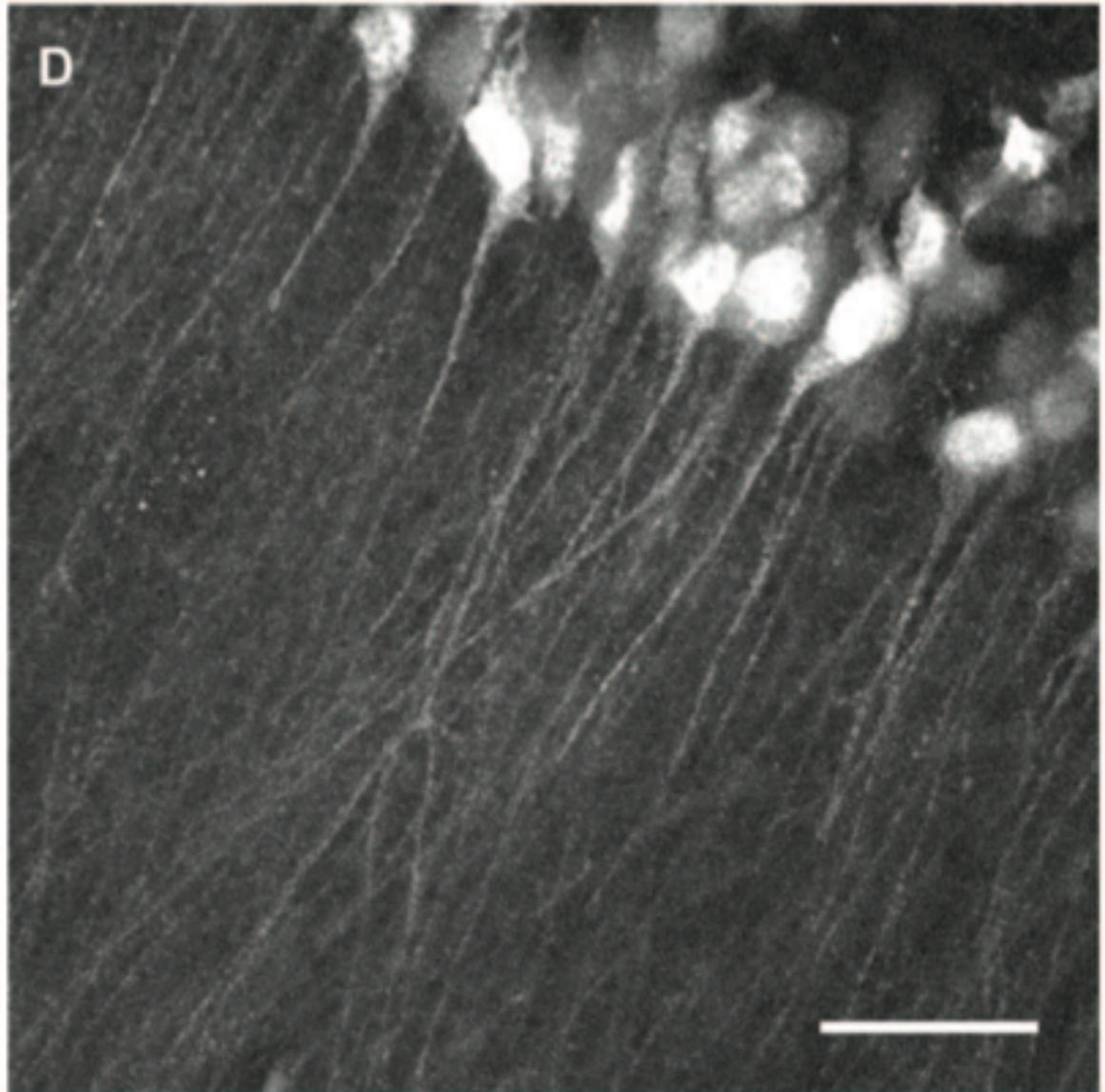
RNA localization spatially regulates gene expression



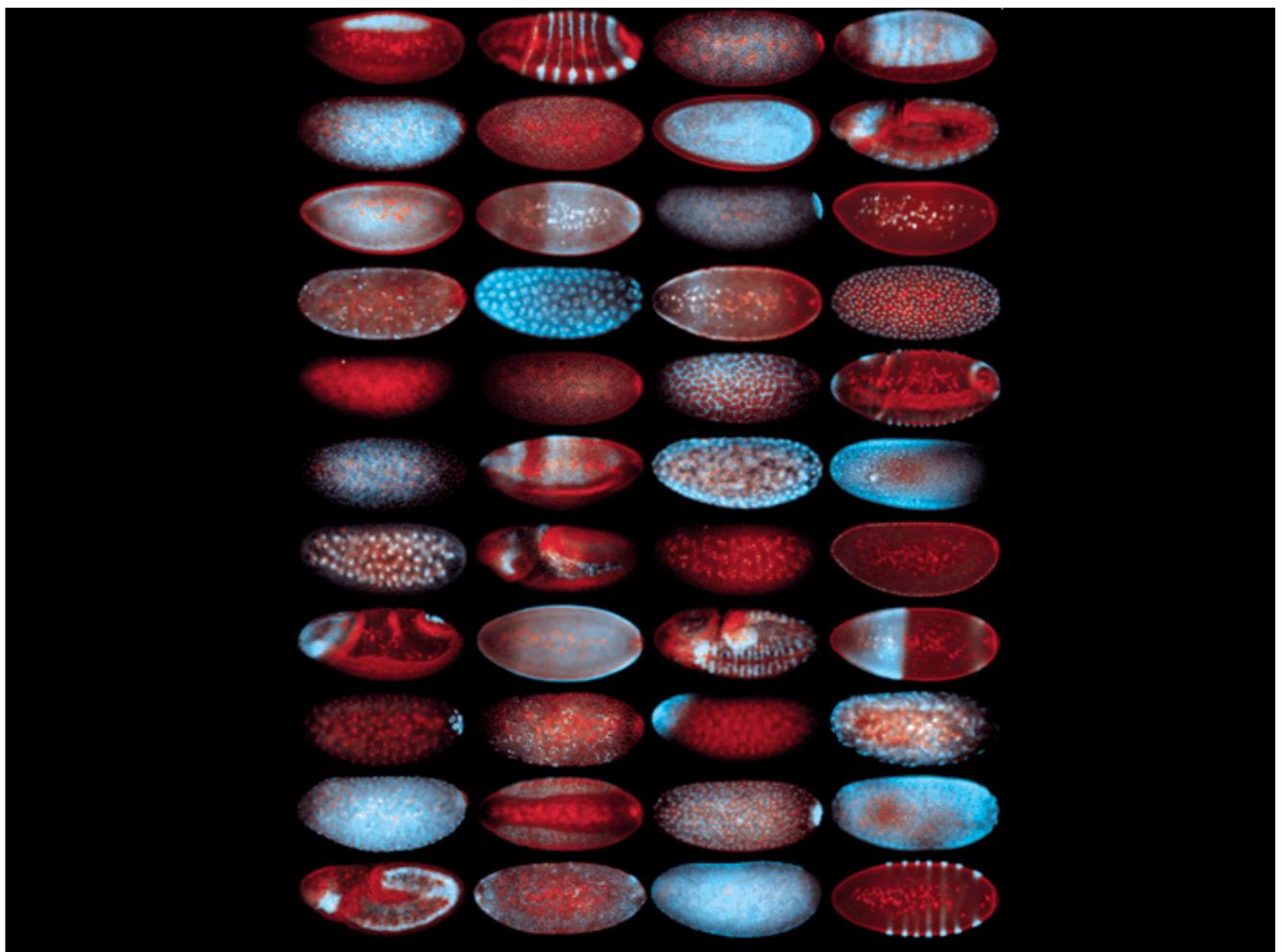
RNA localization regulates diverse processes



RNA localization regulates many transcripts

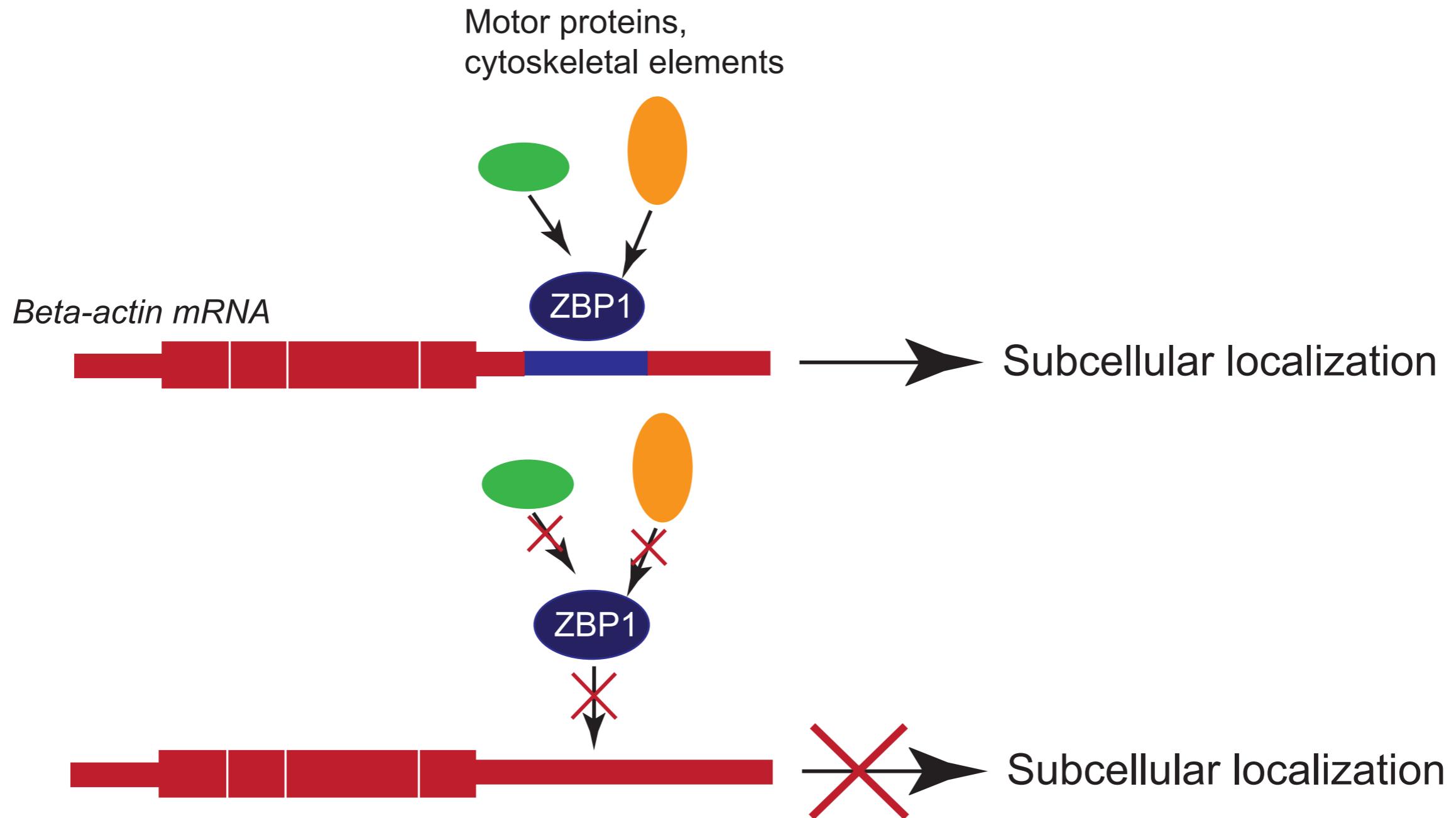


Approximately 1000 transcripts
localized to neuronal projections



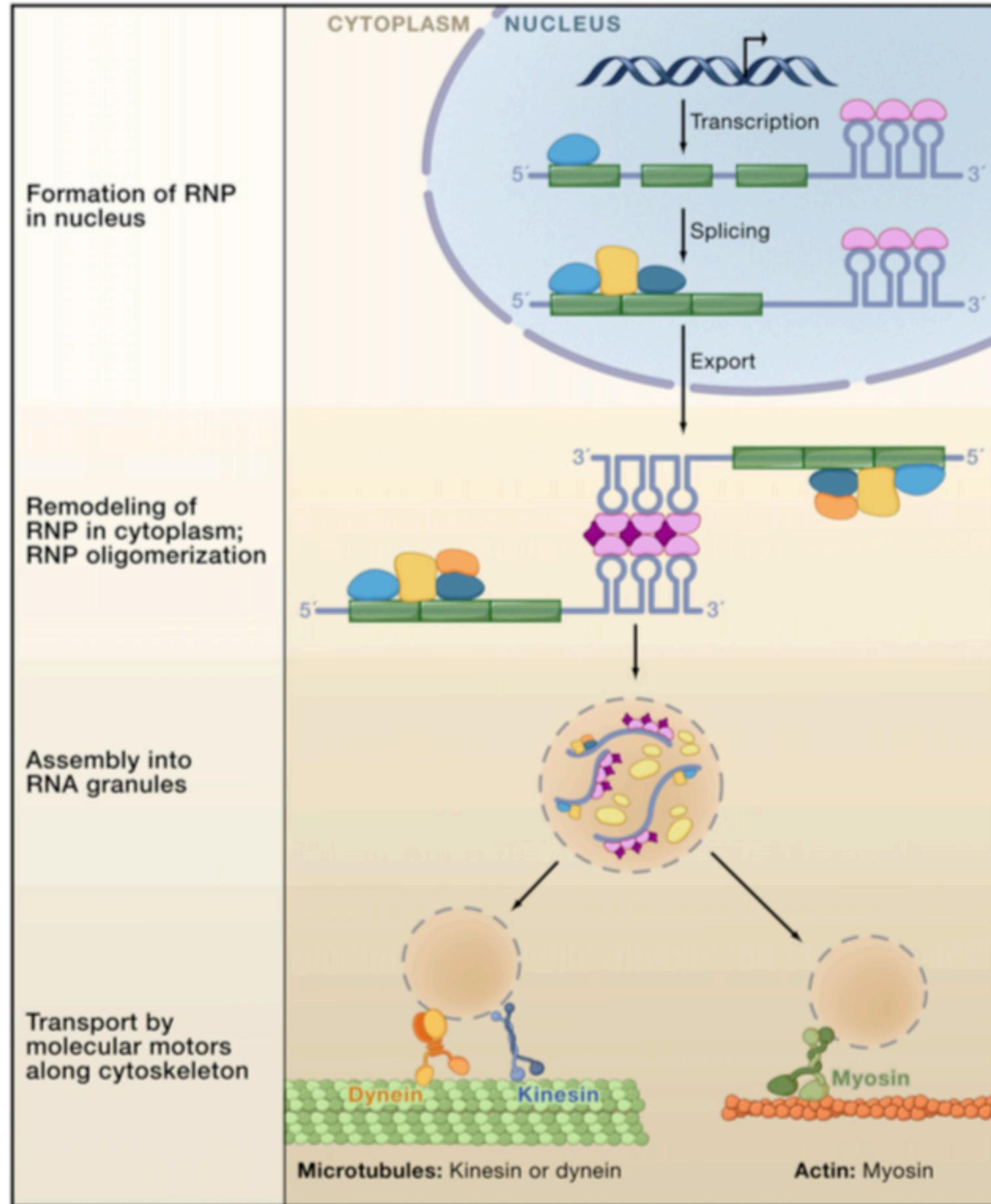
75% of transcripts in *Drosophila*
embryo asymmetrically localized

mRNA metabolism is regulated through RBP interactions



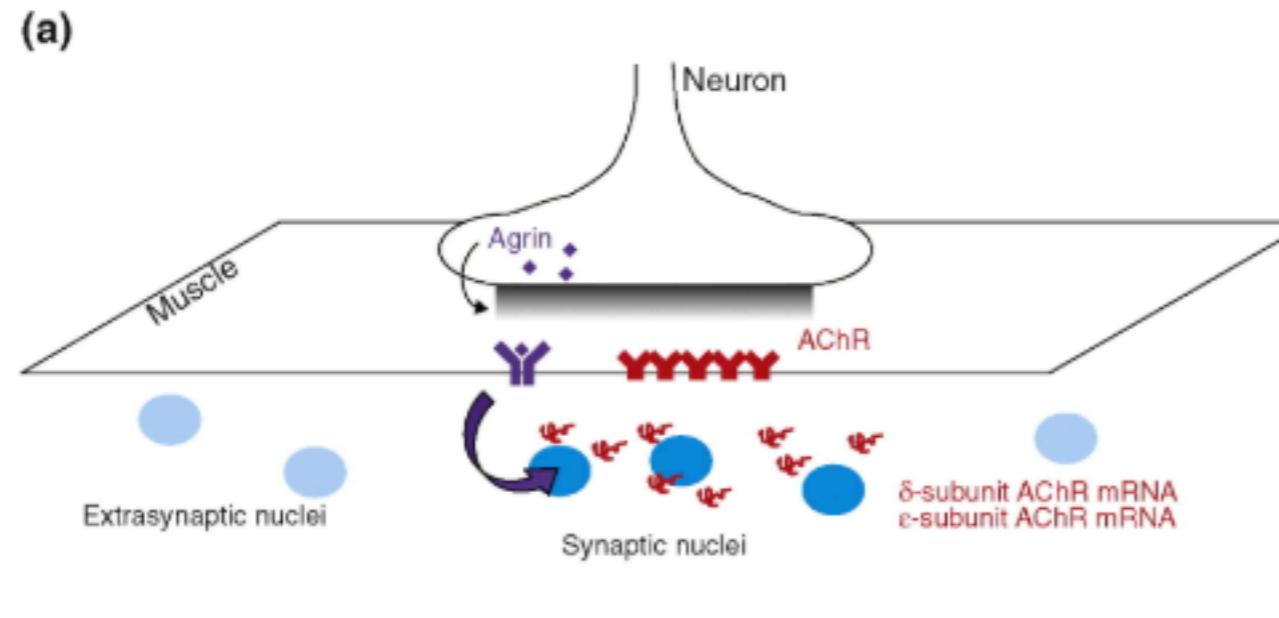
Although thousands of transcripts are asymmetrically localized in eukaryotic cells, we know little of the regulatory language regulating this localization.

mRNA molecules are transported as part of “RNA granules”

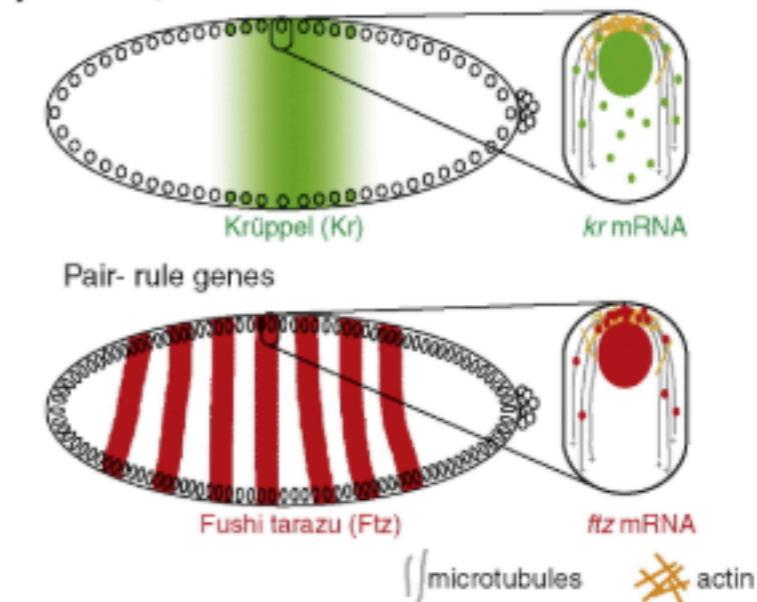


Active transport is not the only way to get asymmetric RNA distributions

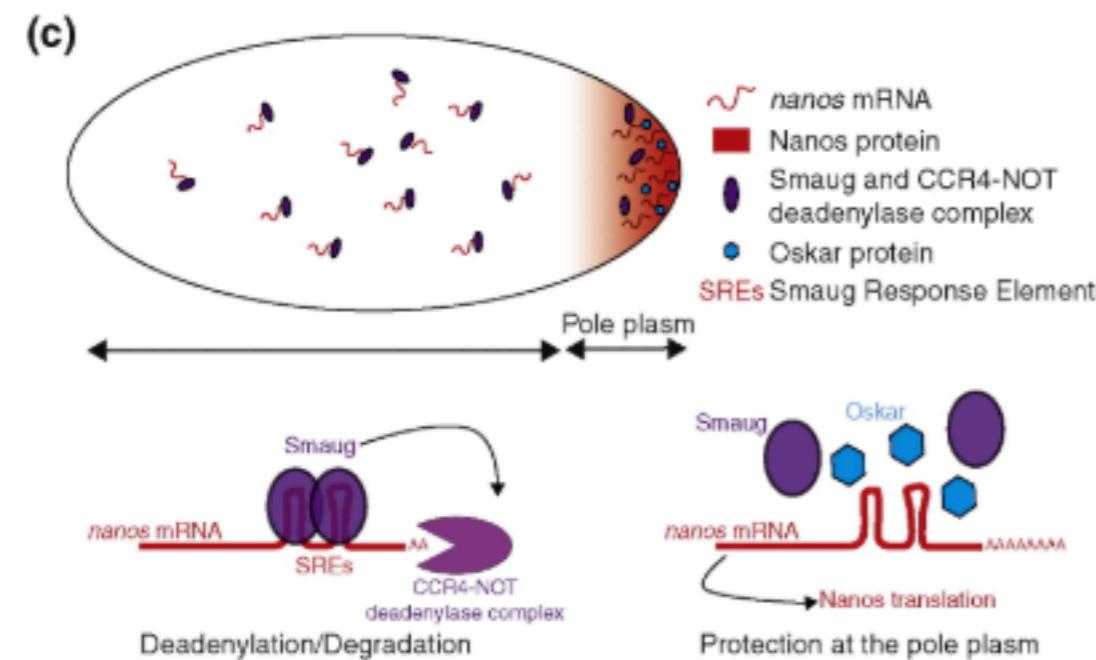
Localized transcription



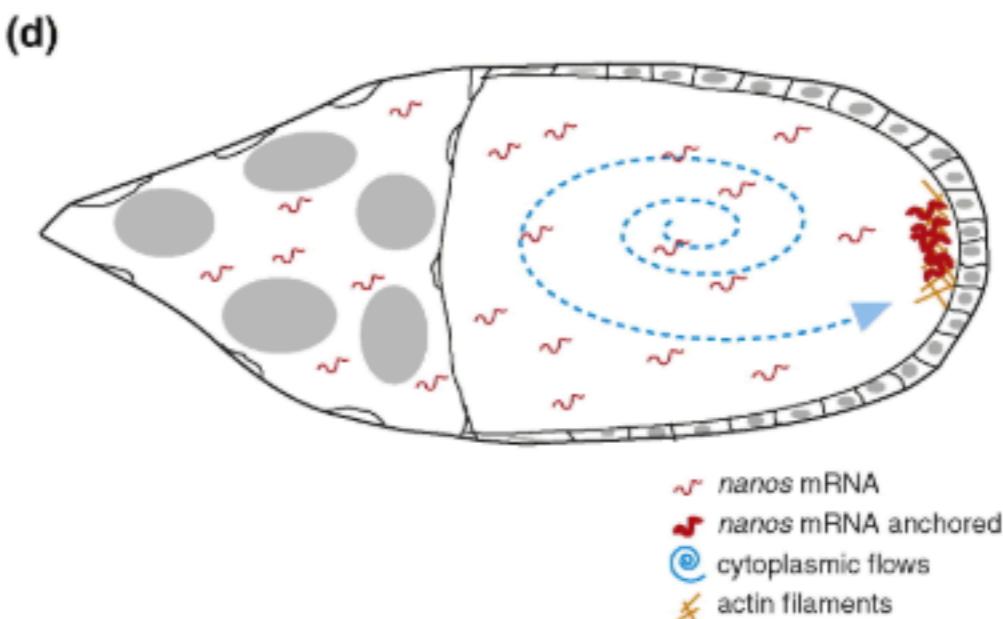
Gap genes



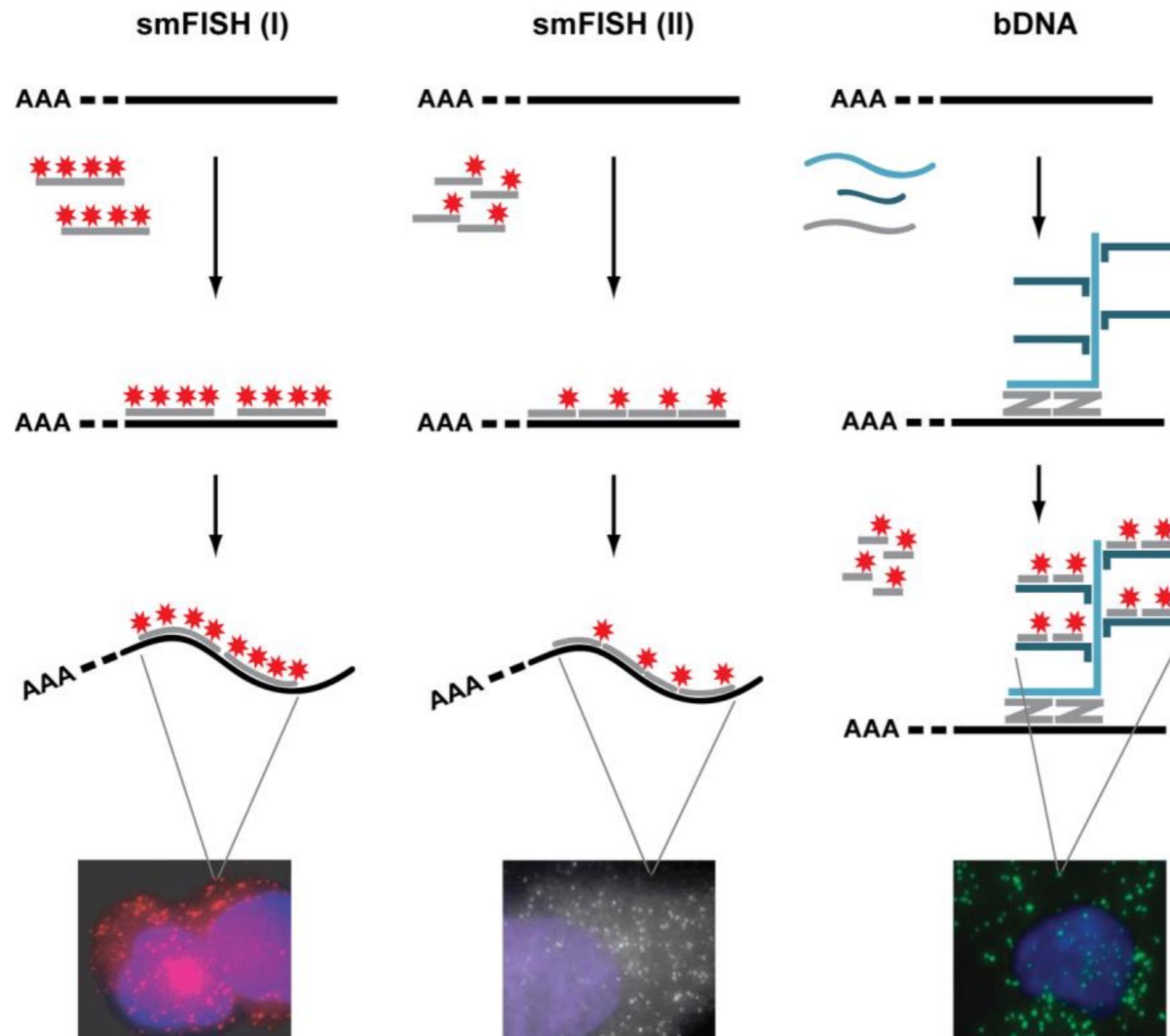
Degradation and stabilization



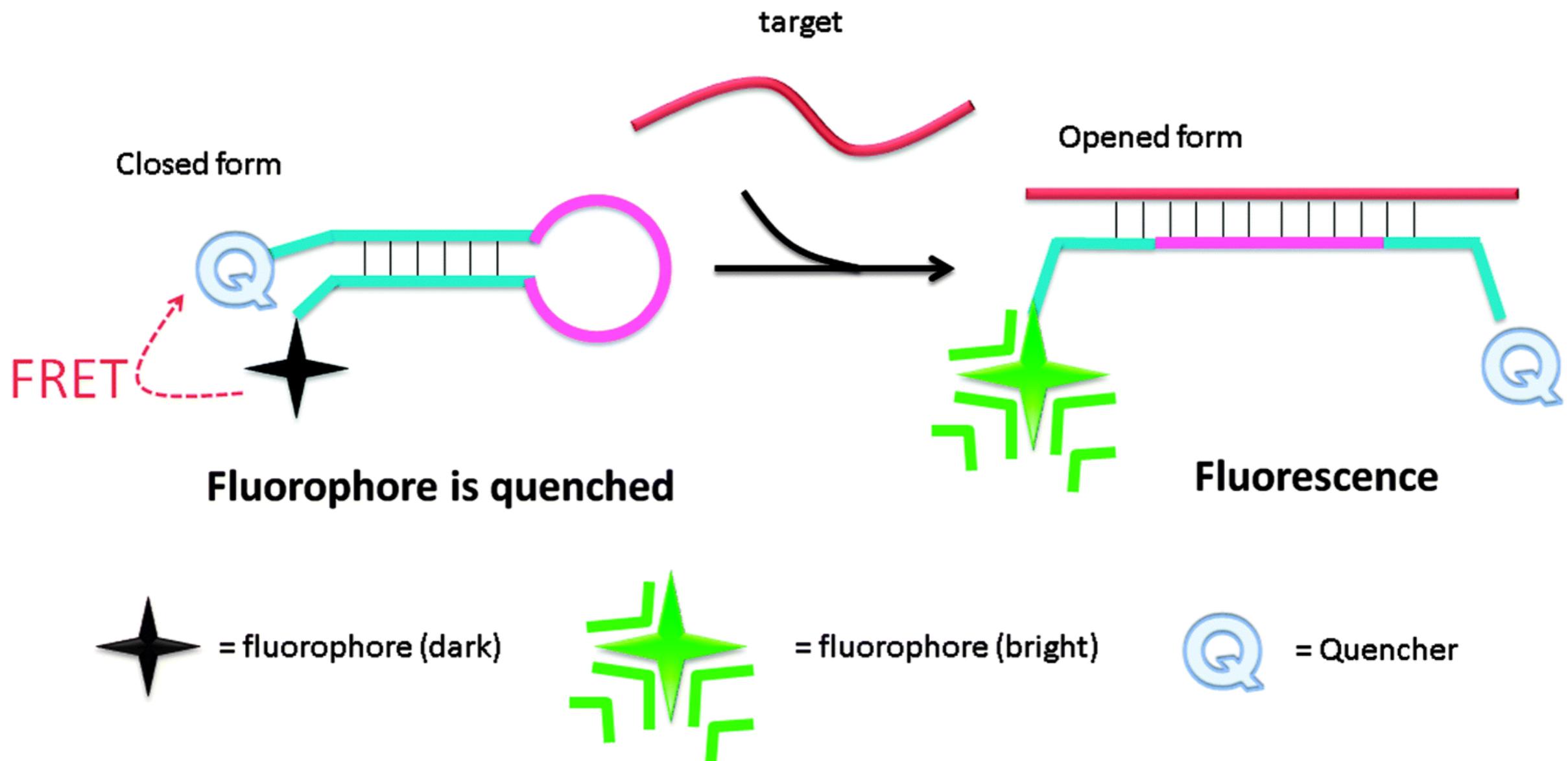
Diffusion and anchoring



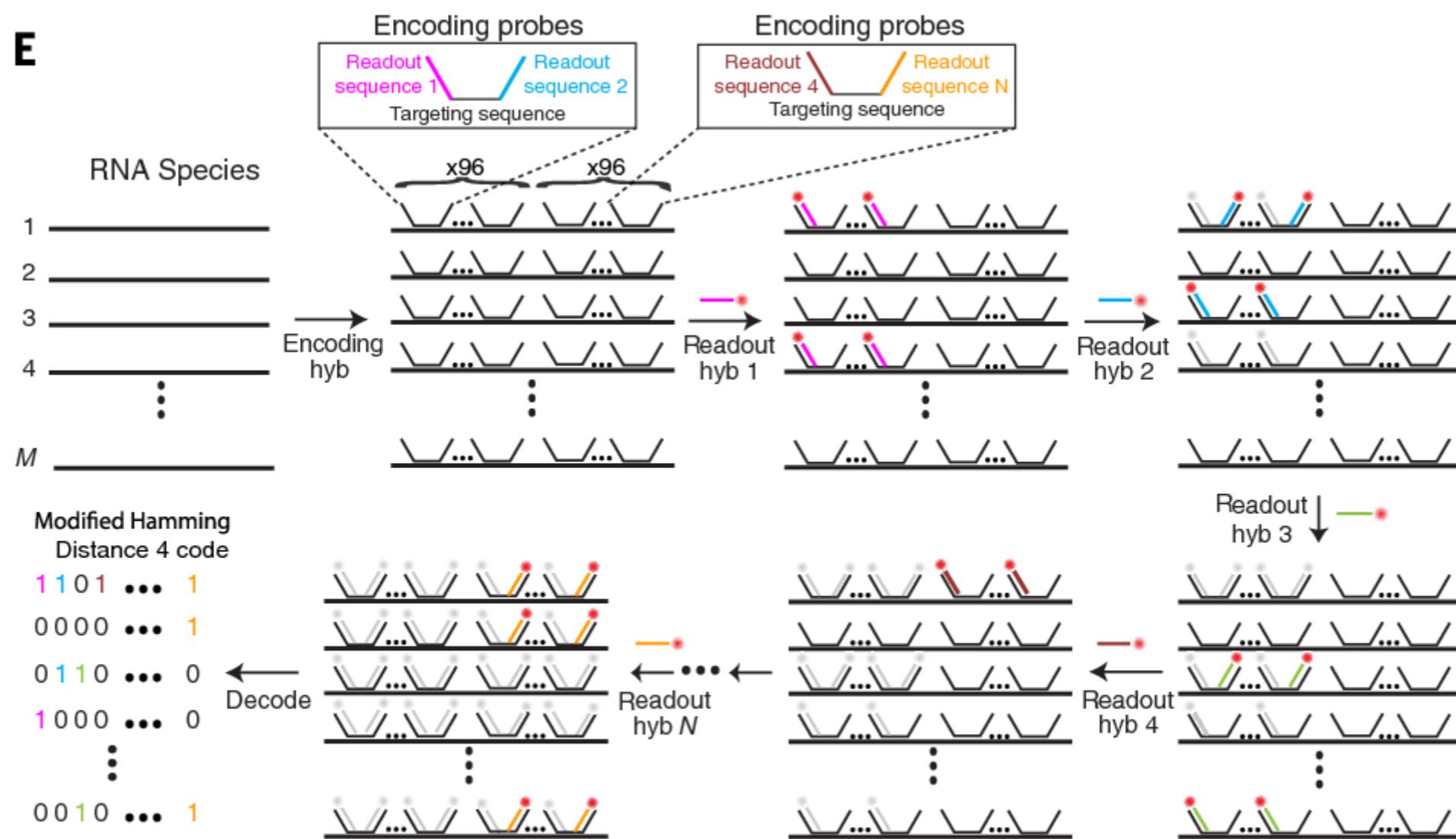
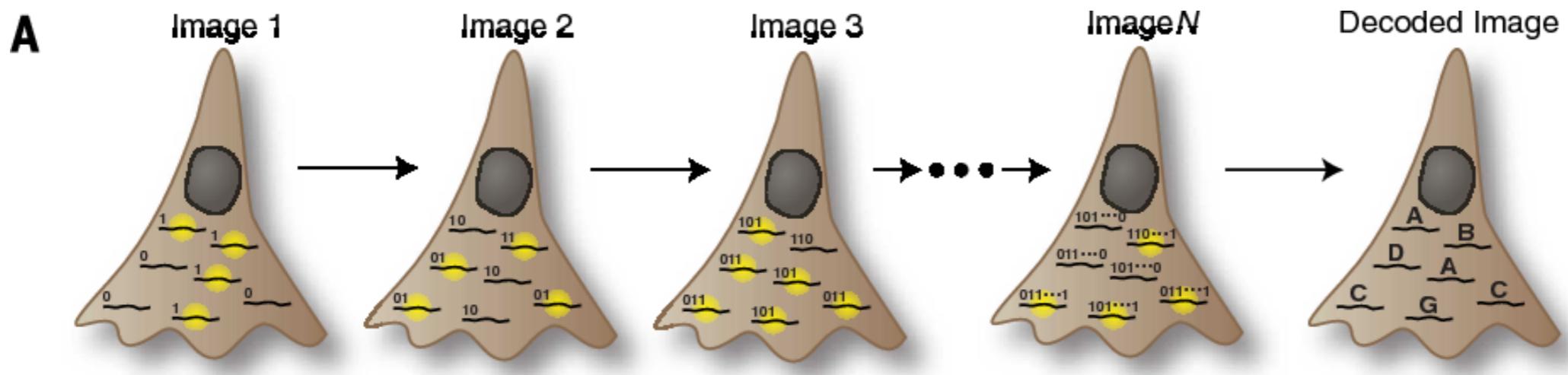
Methods to study RNA localization: smFISH



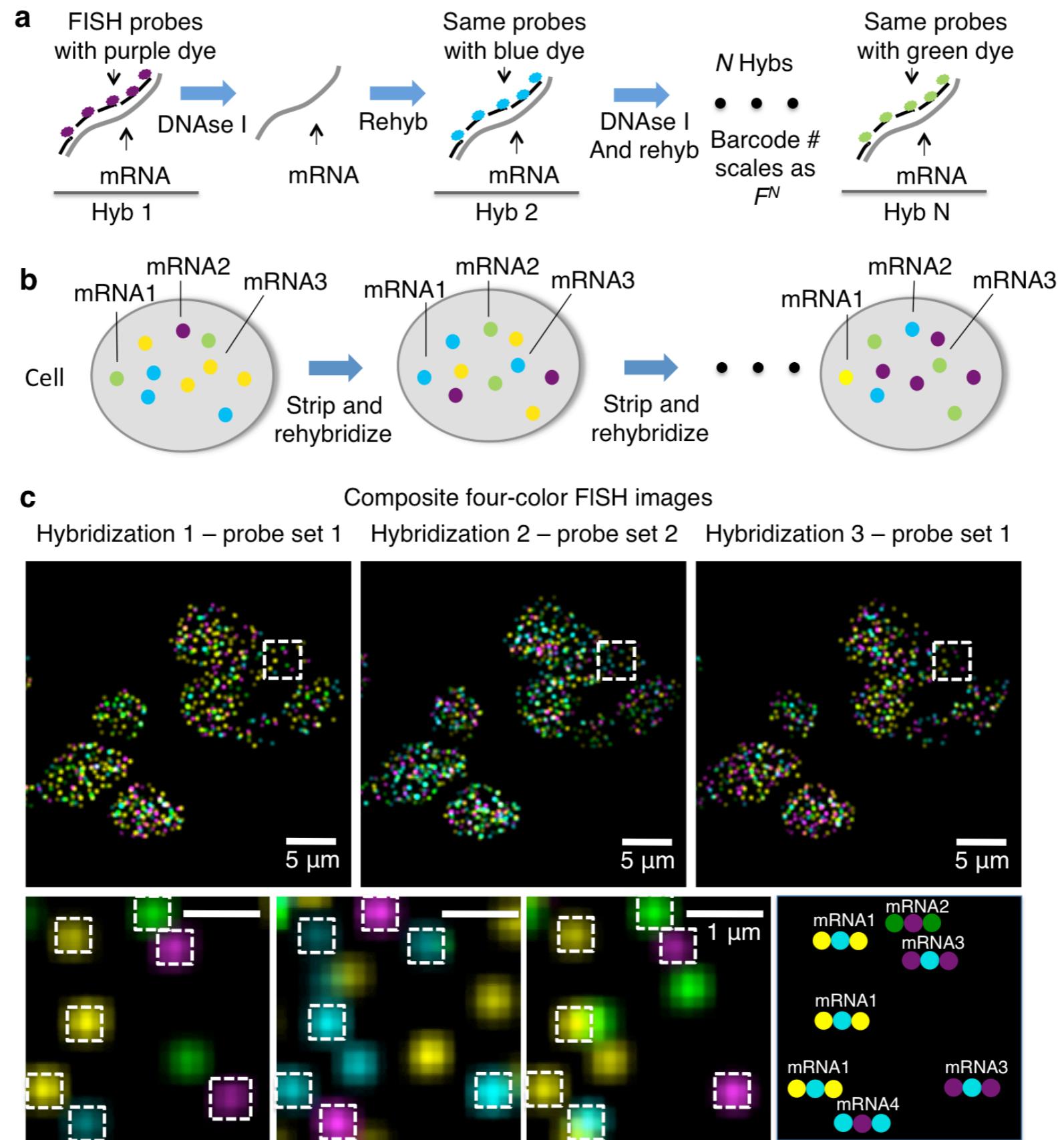
Methods to study RNA localization: molecular beacons



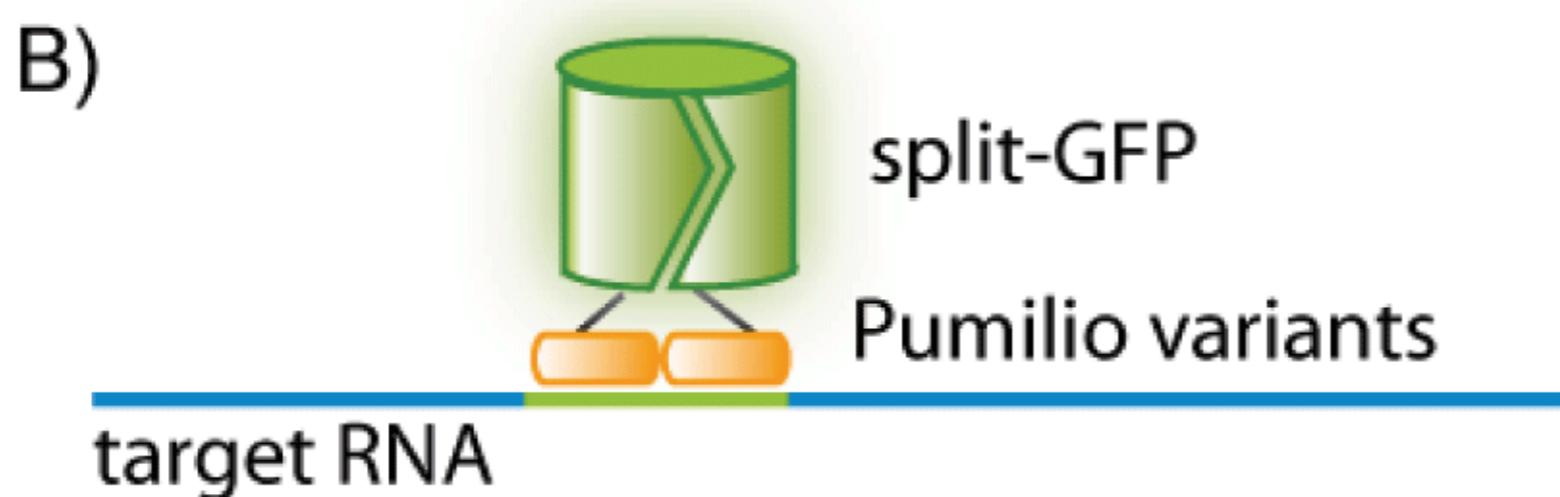
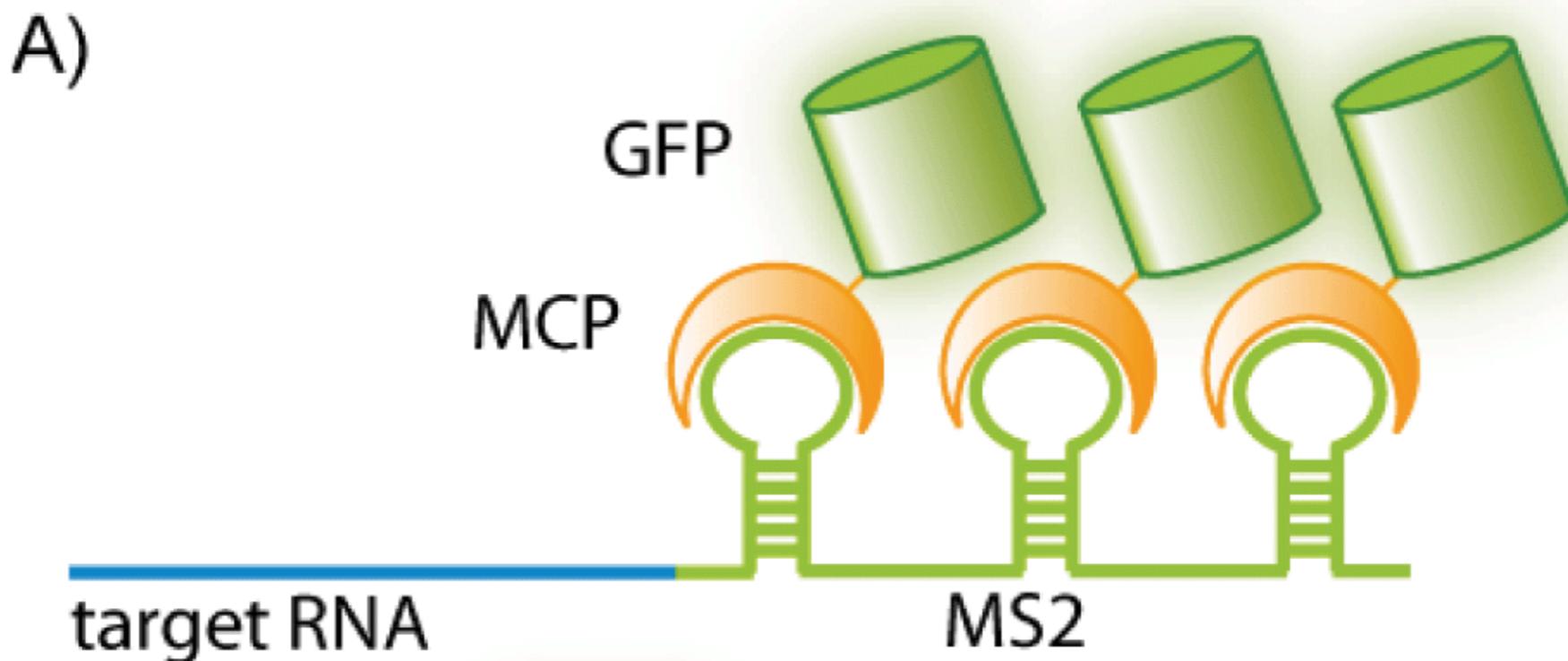
Methods to study RNA localization: MERFISH



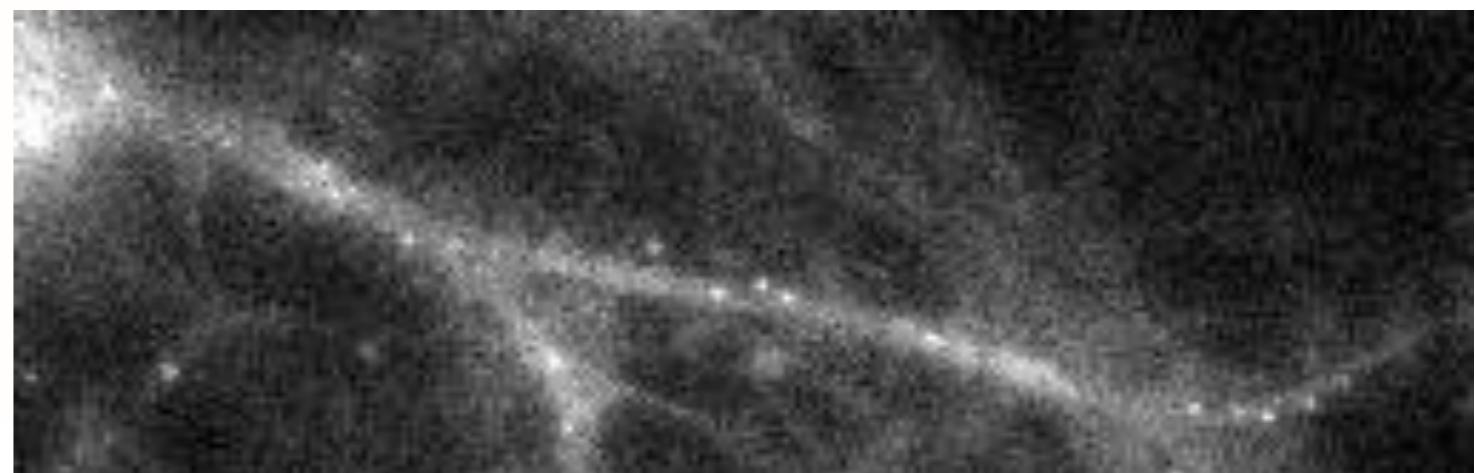
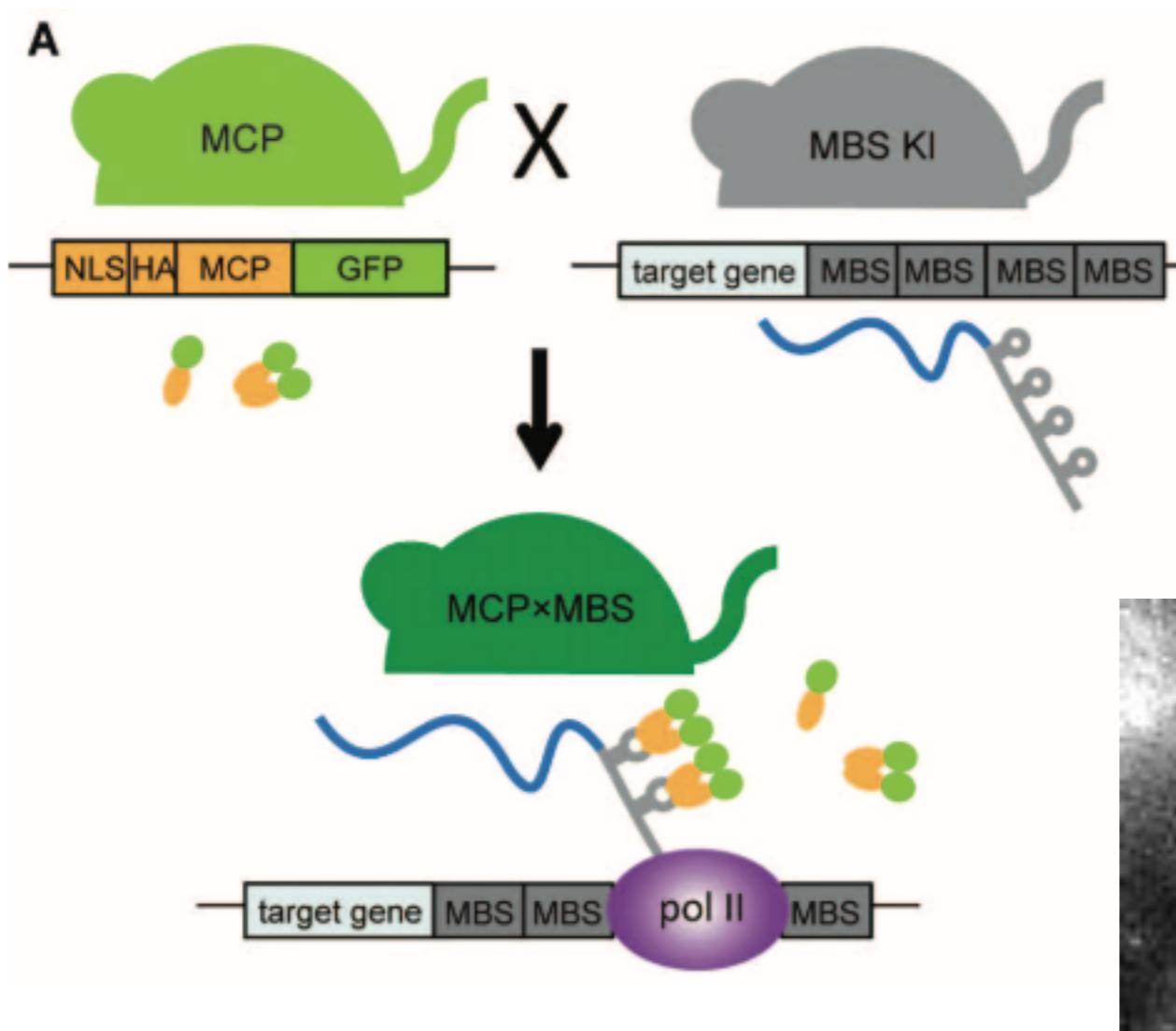
Methods to study RNA localization: SEQFISH



Methods to study RNA localization: visualizing RNA in live cells

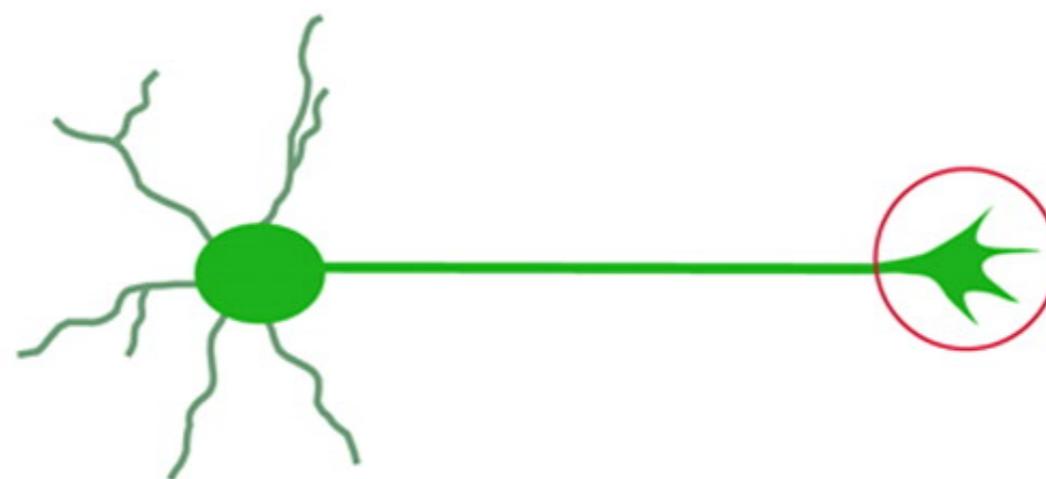


Methods to study RNA localization: visualizing RNA in live cells

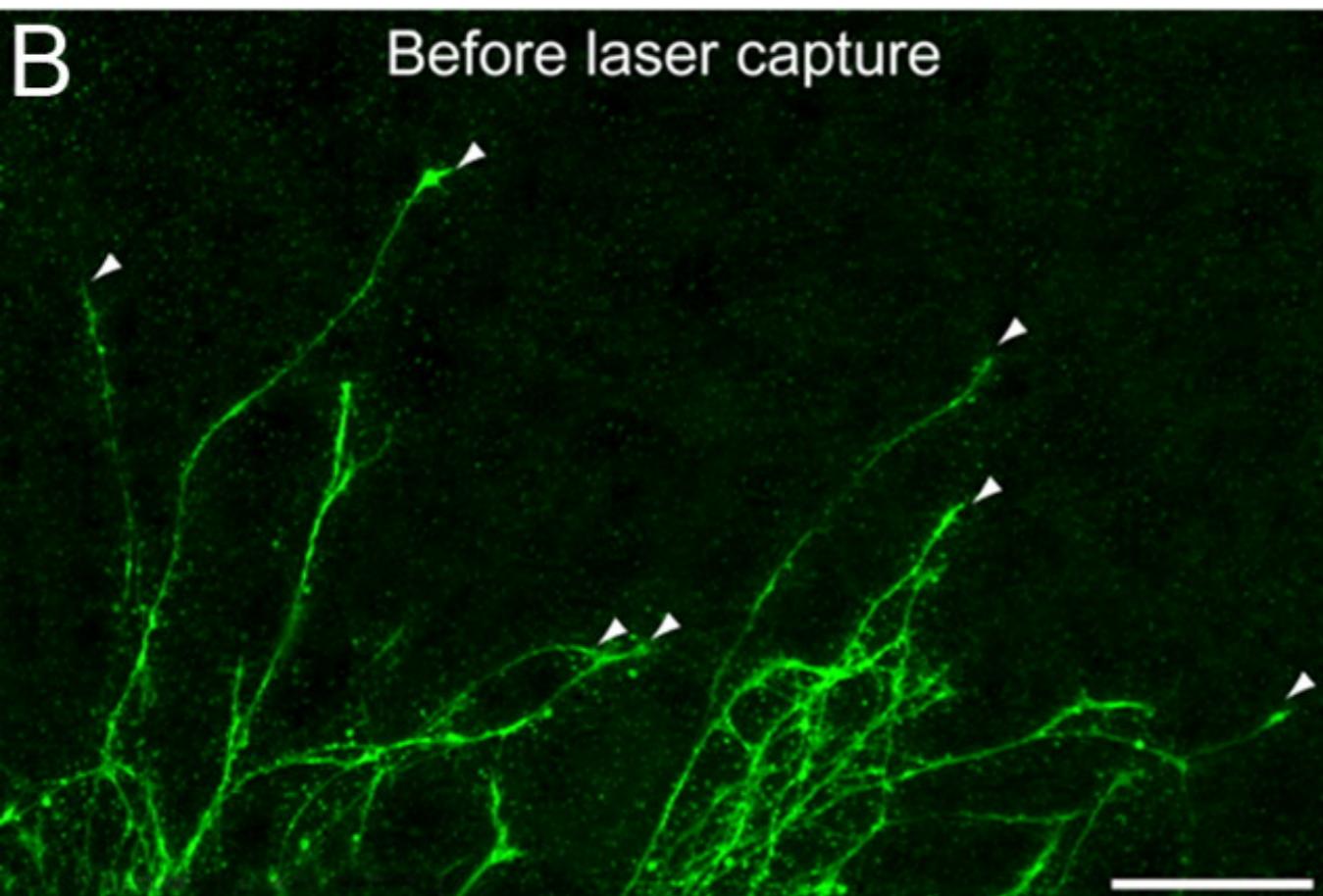


Methods to study RNA localization: laser capture microdissection

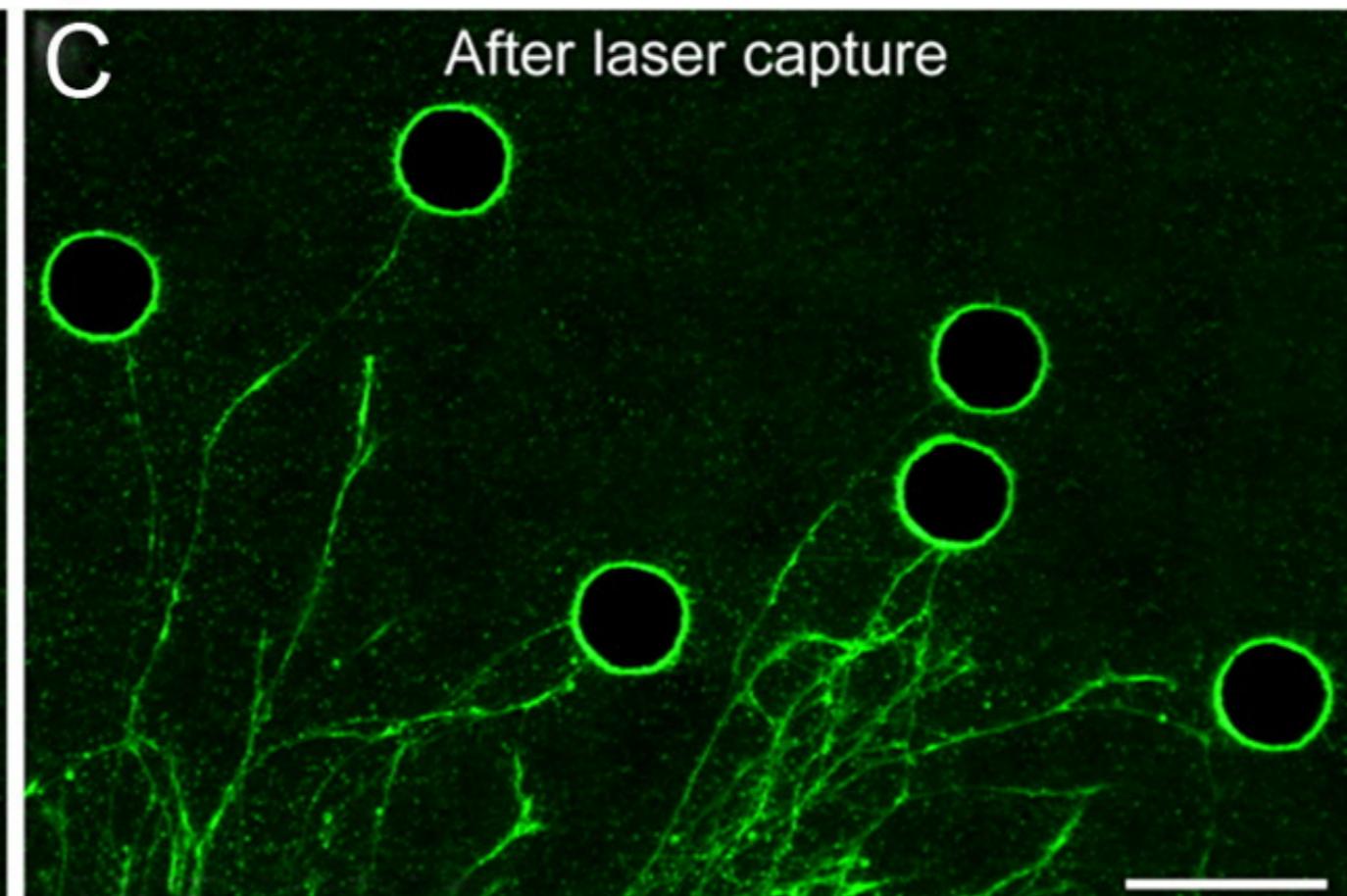
A



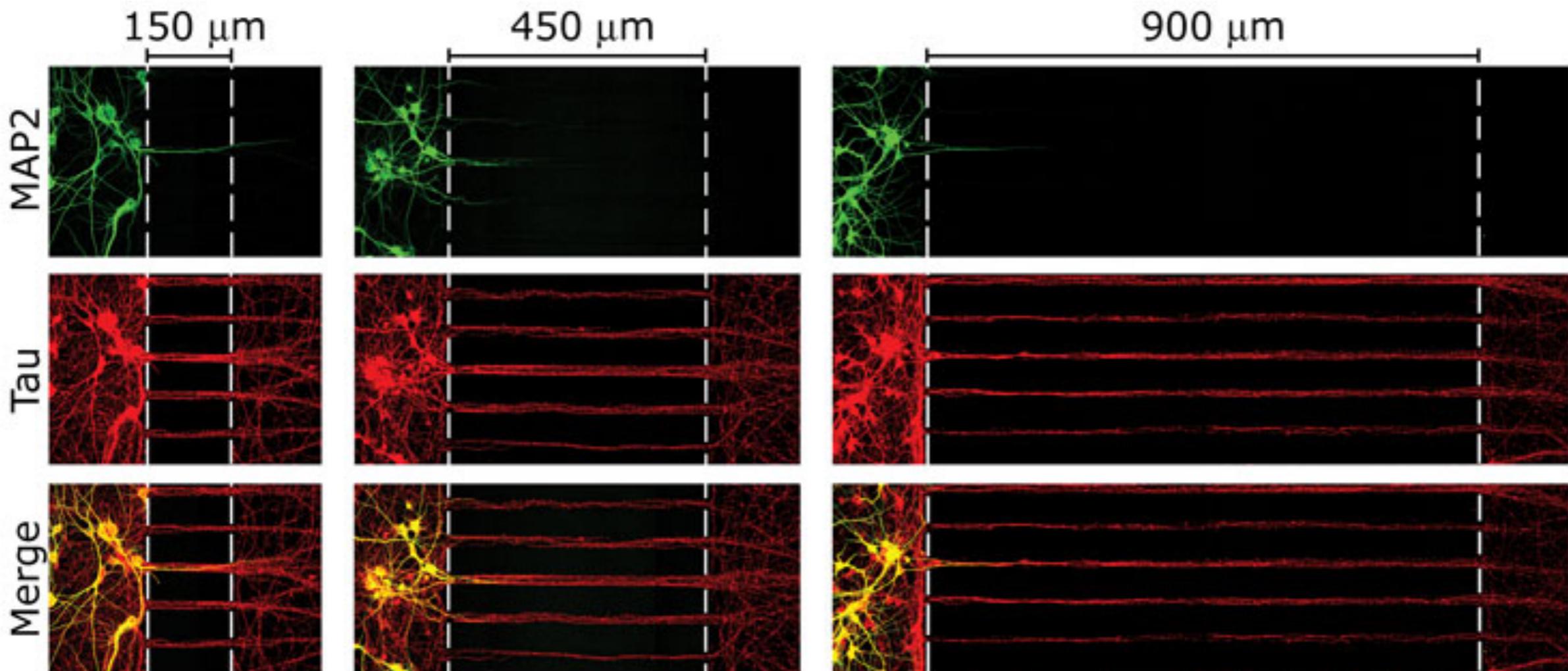
B



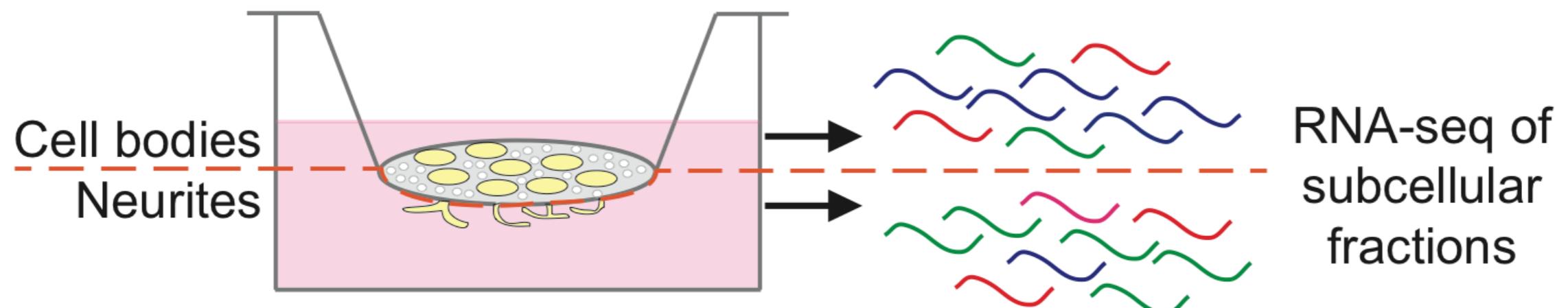
C



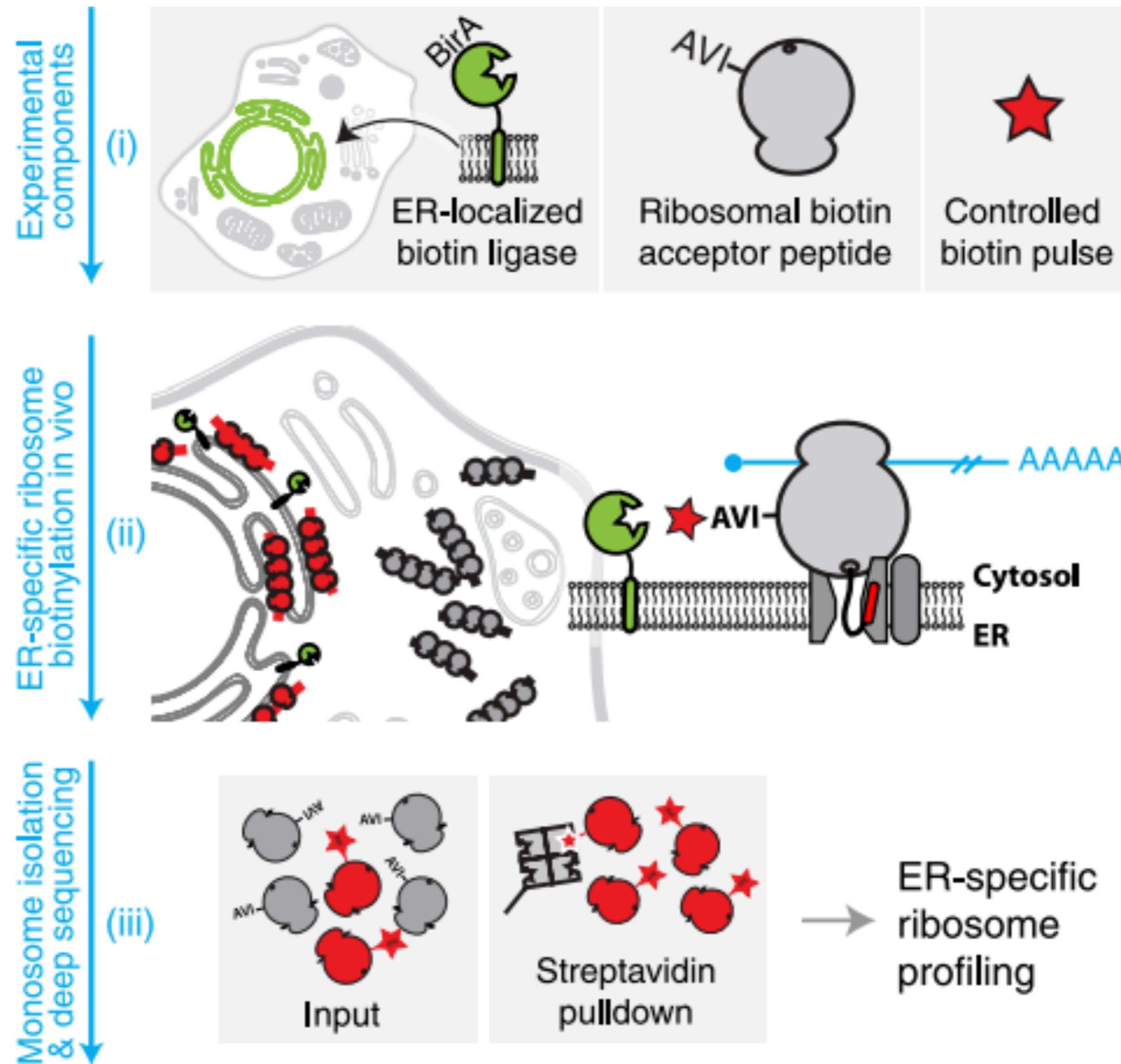
Methods to study RNA localization: microfluidics



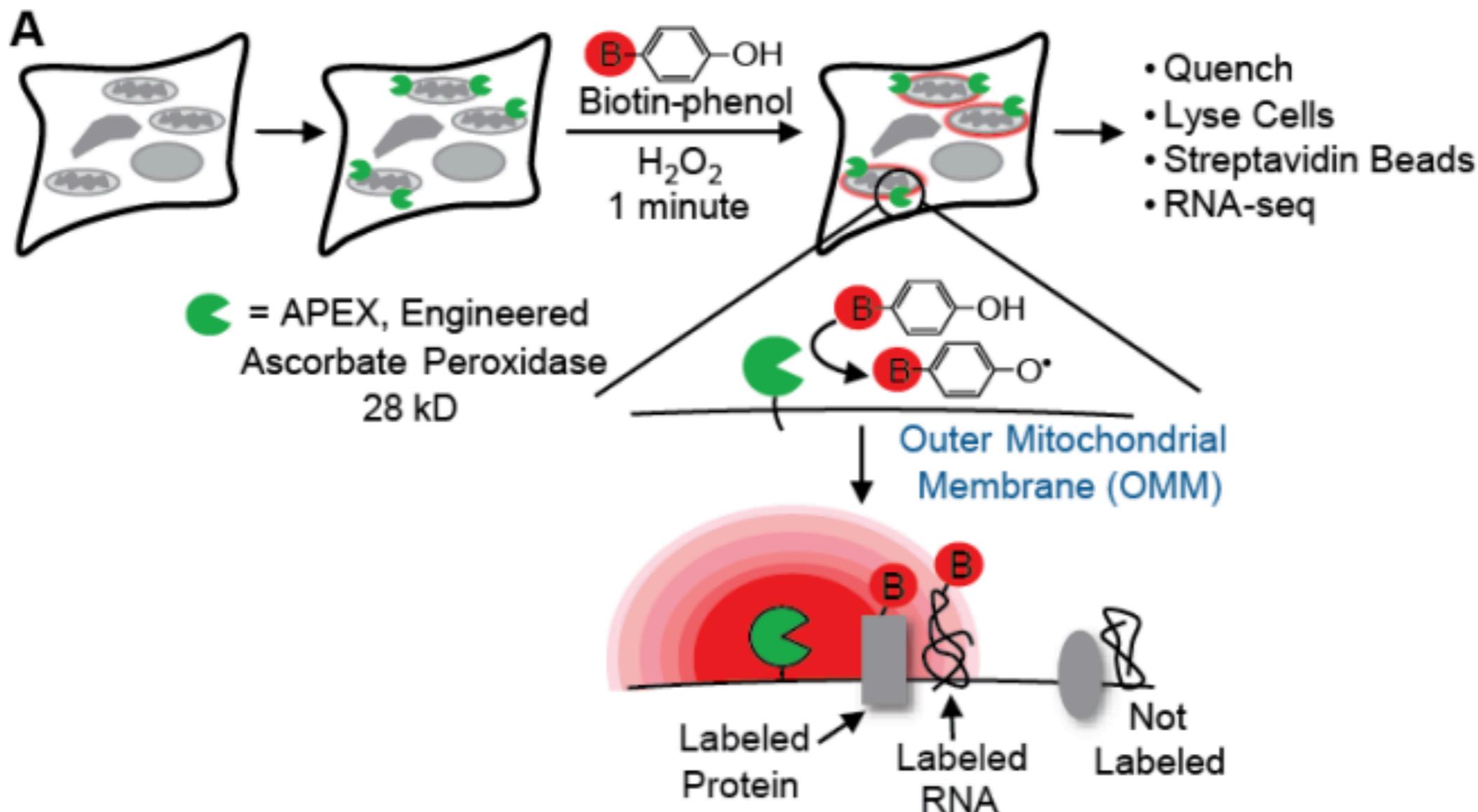
Methods to study RNA localization: transwell assay



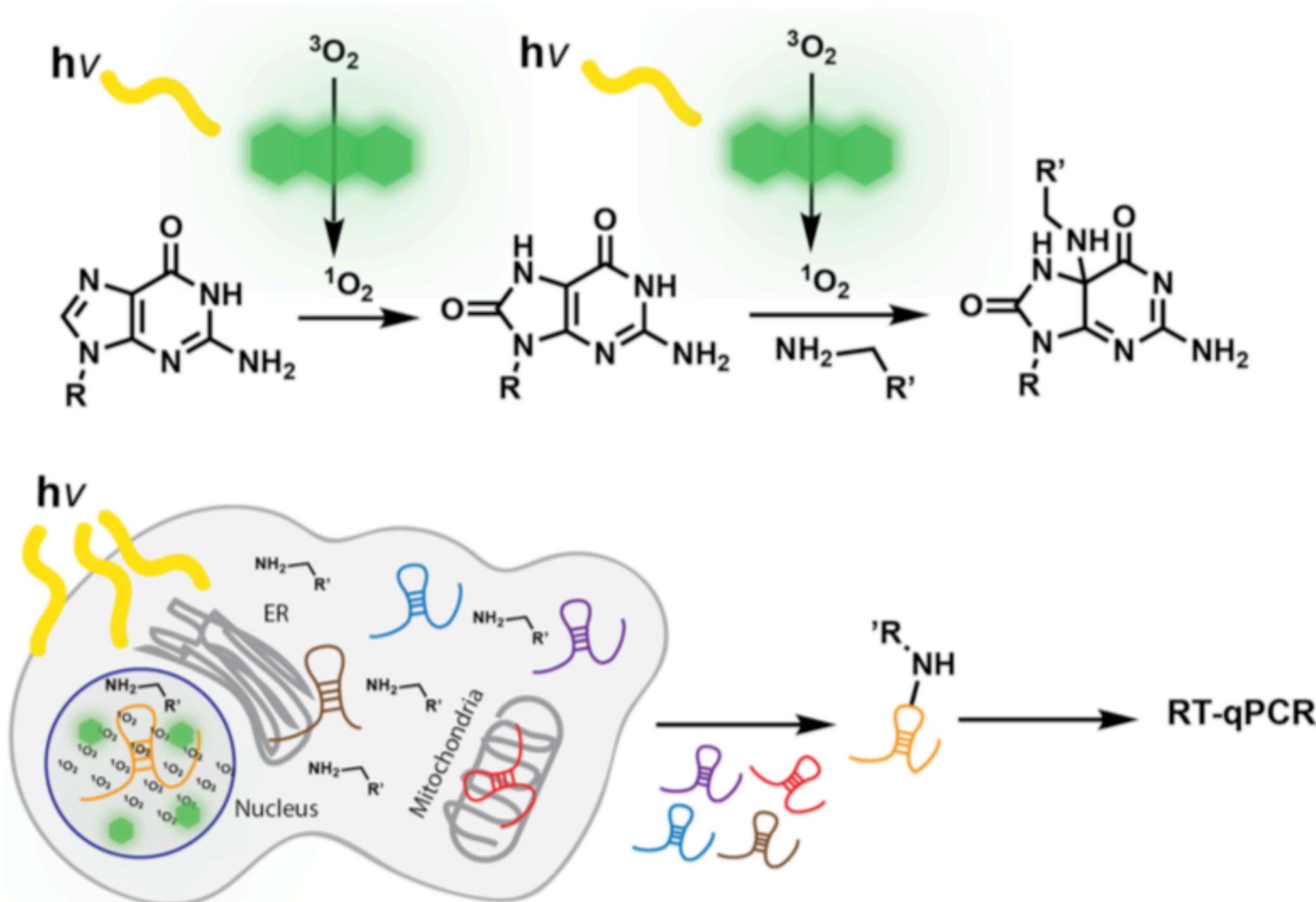
Methods to study RNA localization: proximity-based approaches



Methods to study RNA localization: proximity-based approaches



Methods to study RNA localization: proximity-based approaches

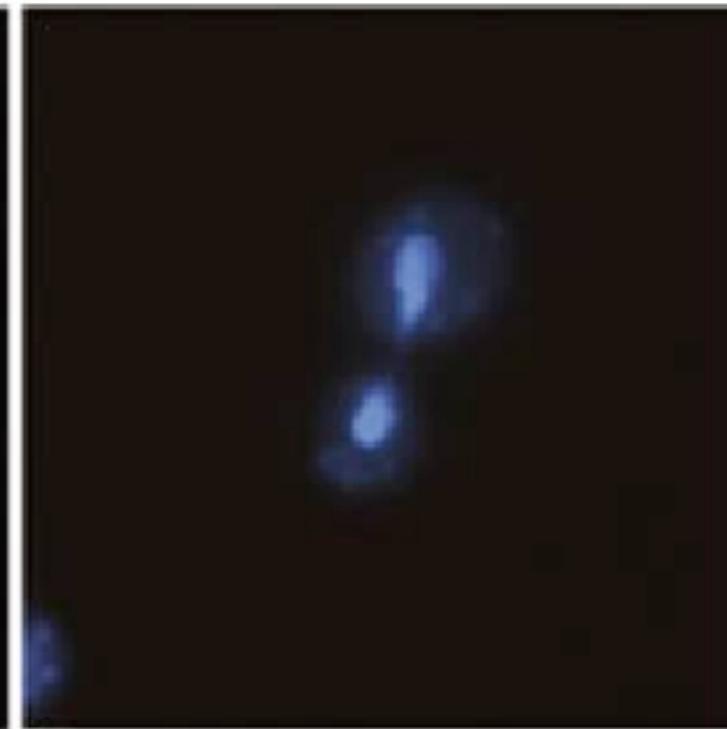


RNA localization systems: ASH1

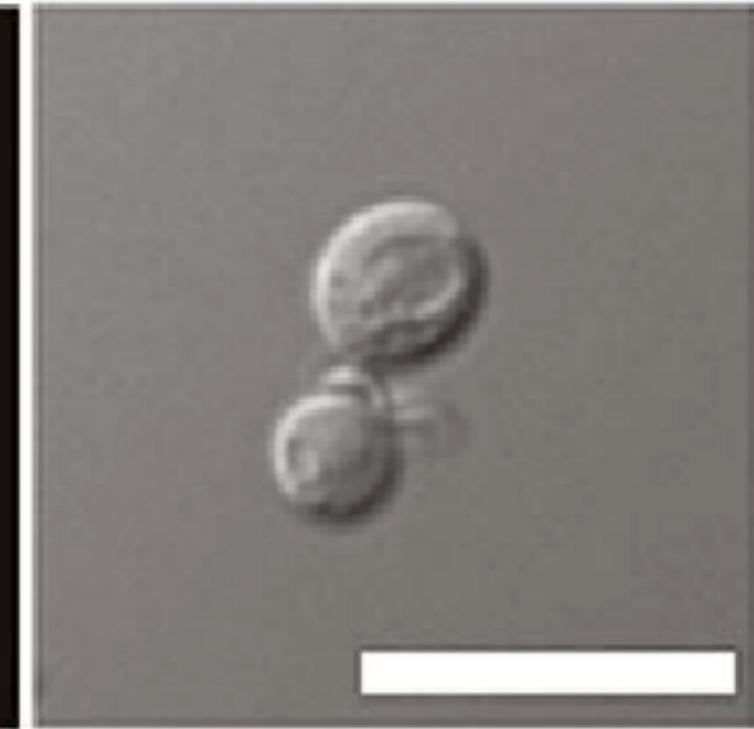
ASH1
mRNA



DAPI

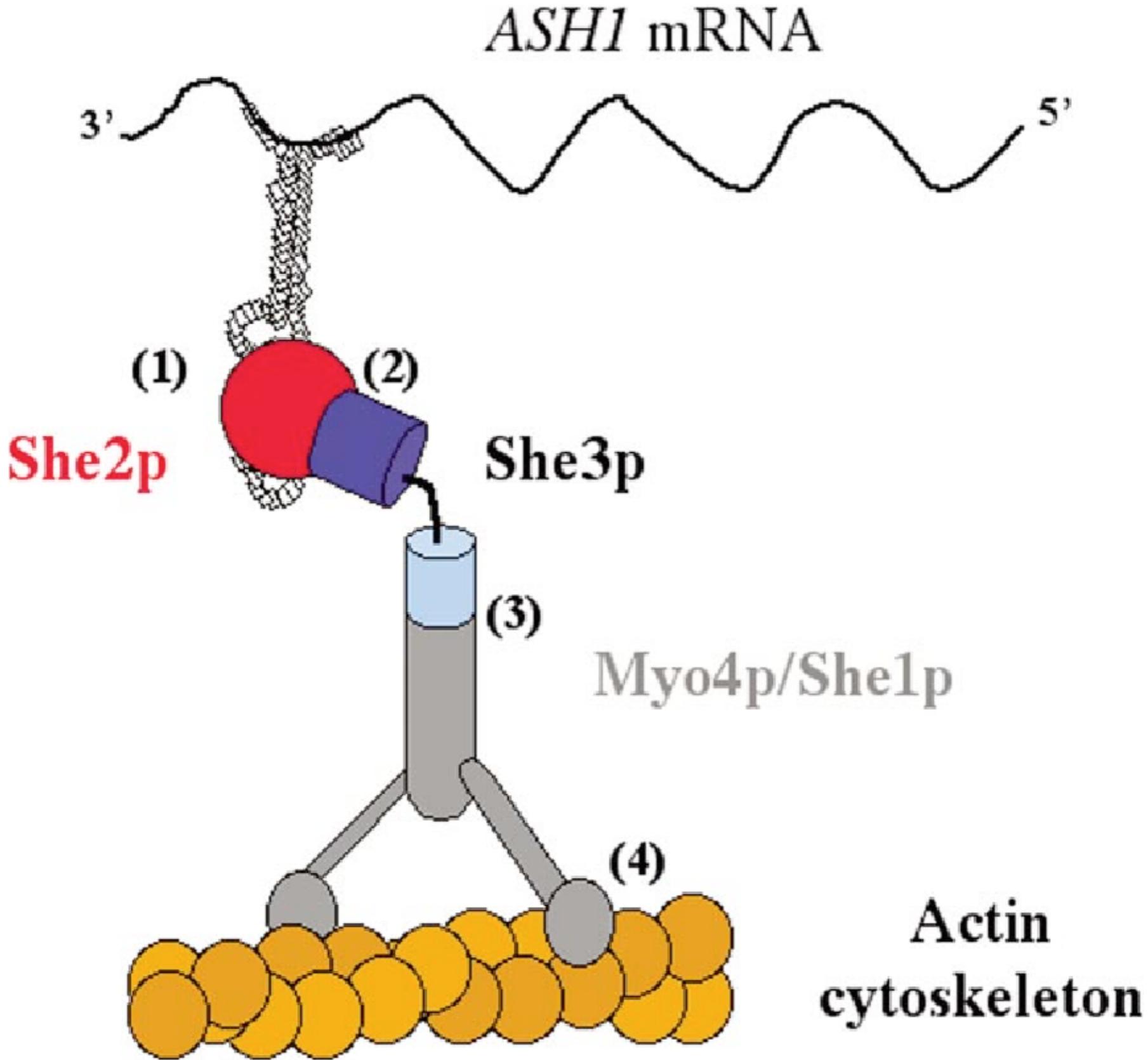


NOM.

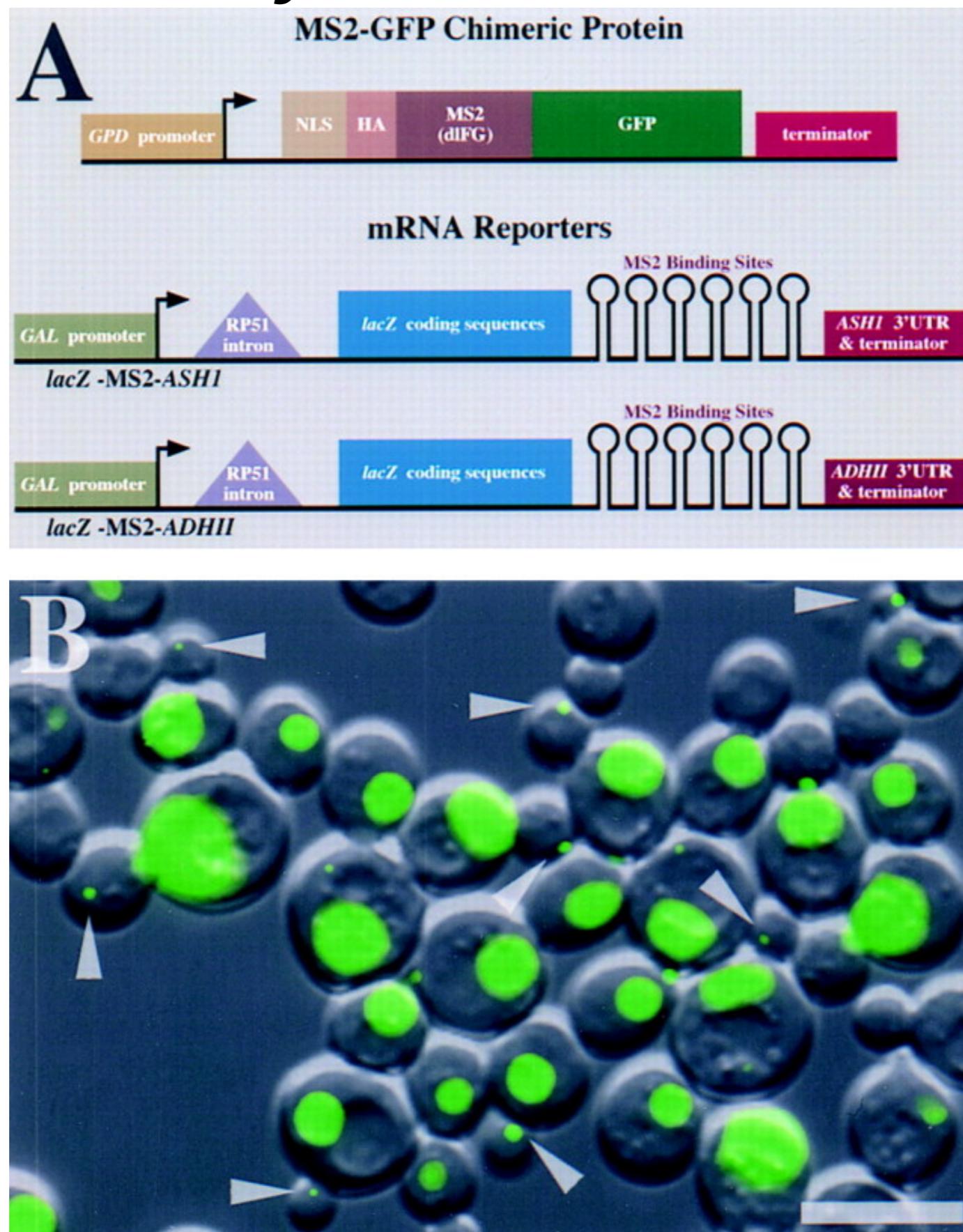


The presence of Ash1p in the daughter cell (but not the mother) facilitates mating type switching. The buildup of Ash1p in the daughter cell is driven by localizing ASH1 mRNA to the daughter.

RNA localization systems: ASH1



RNA localization systems: ASH1

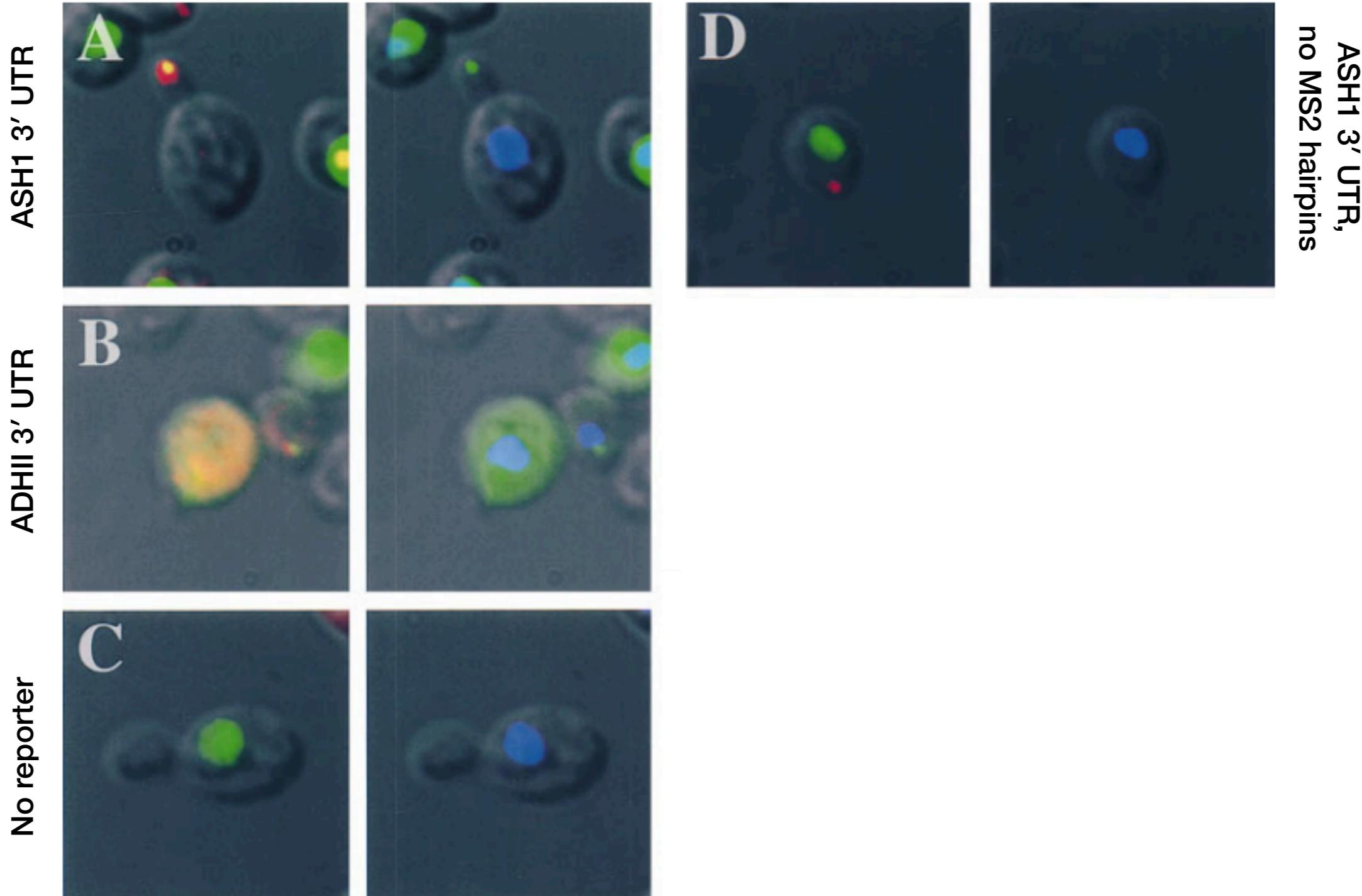


Bertrand et al (1998)

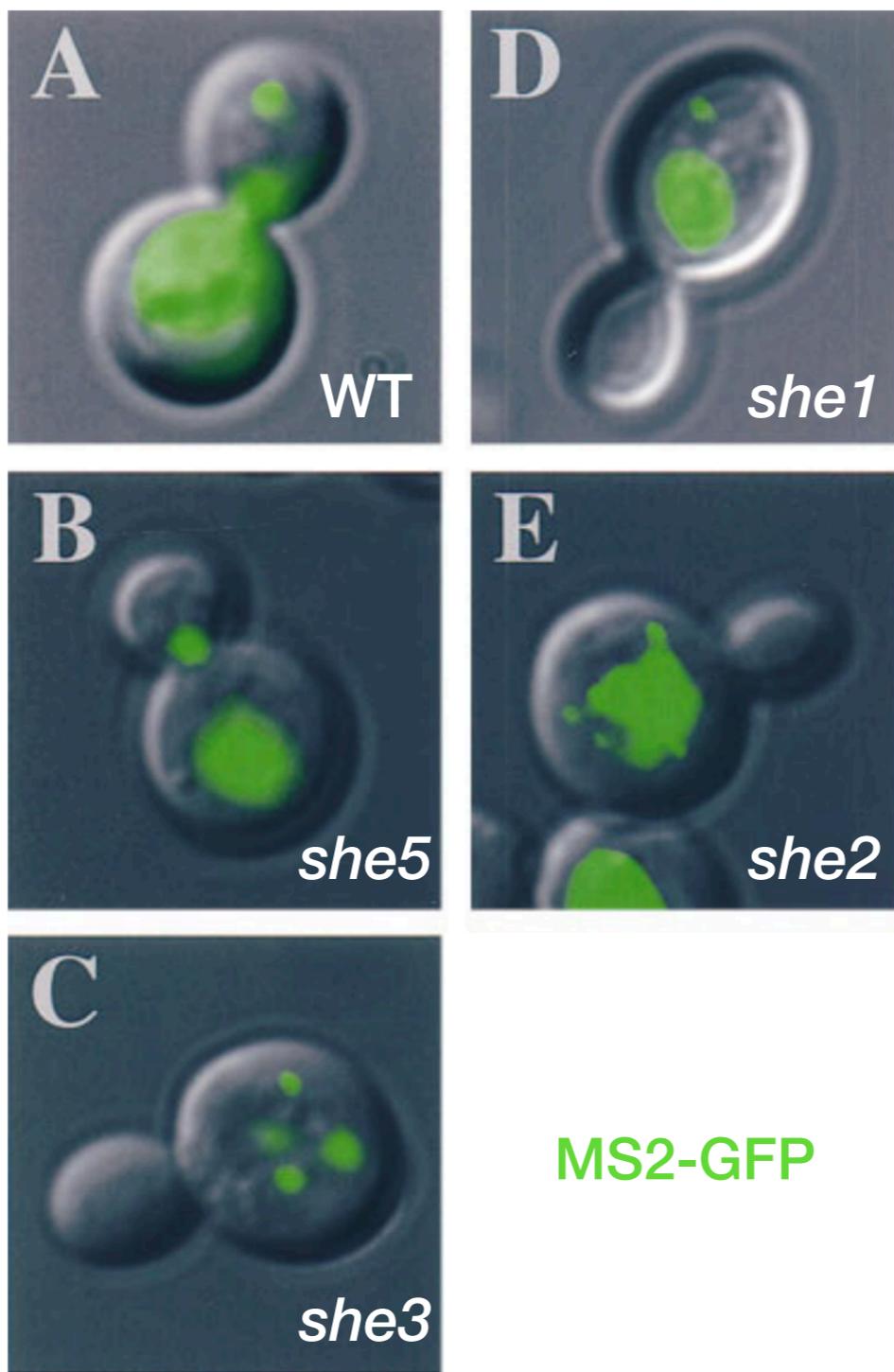
RNA localization systems: ASH1

MS2-GFP

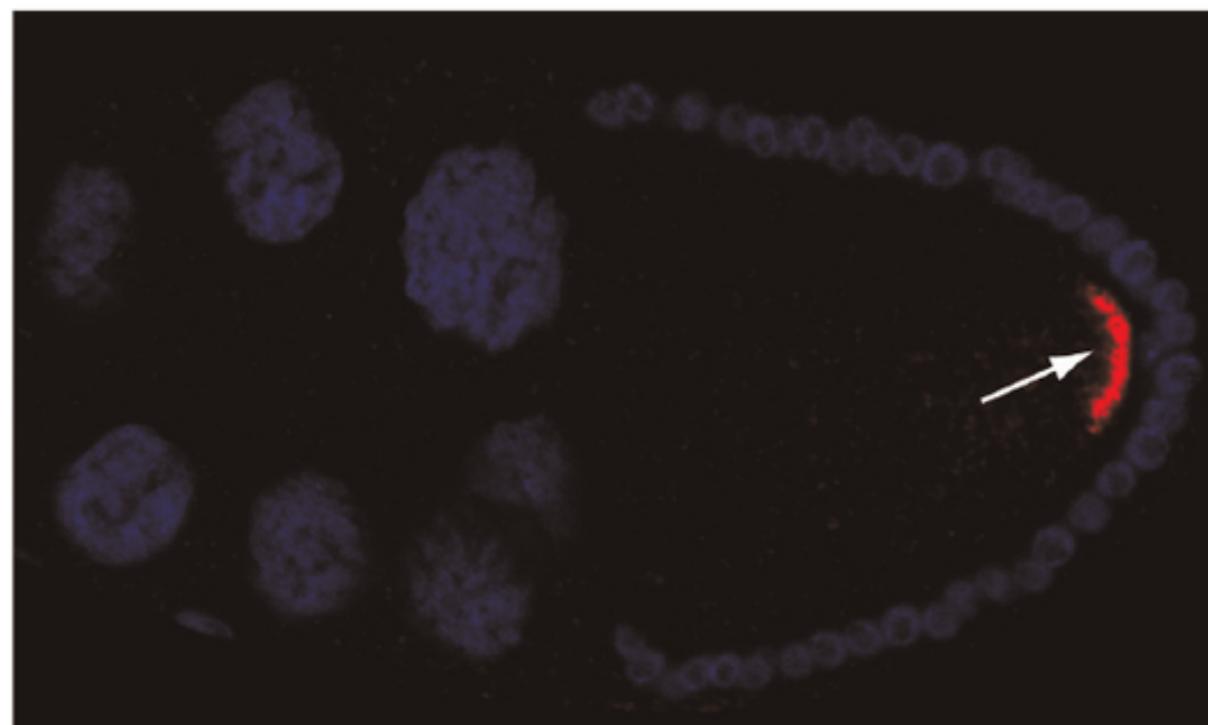
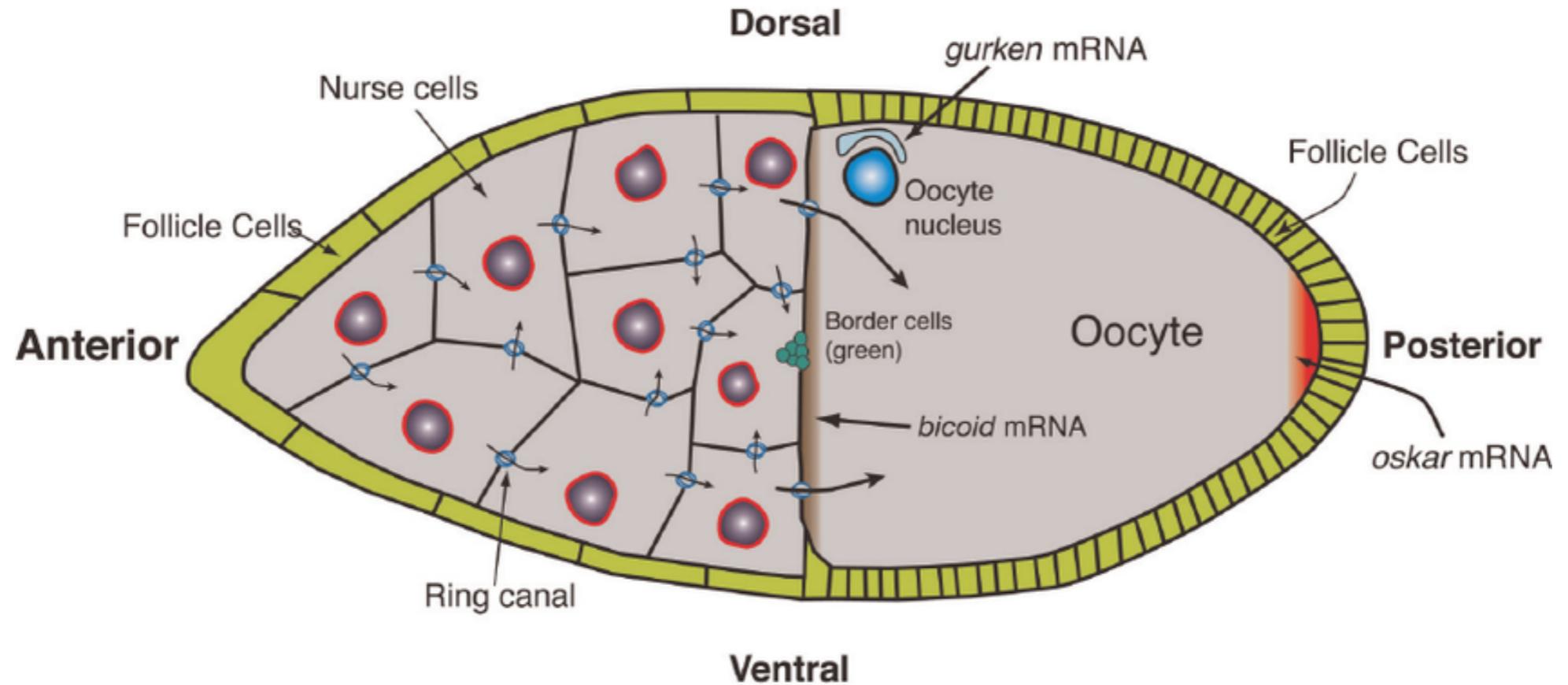
lacZ FISH



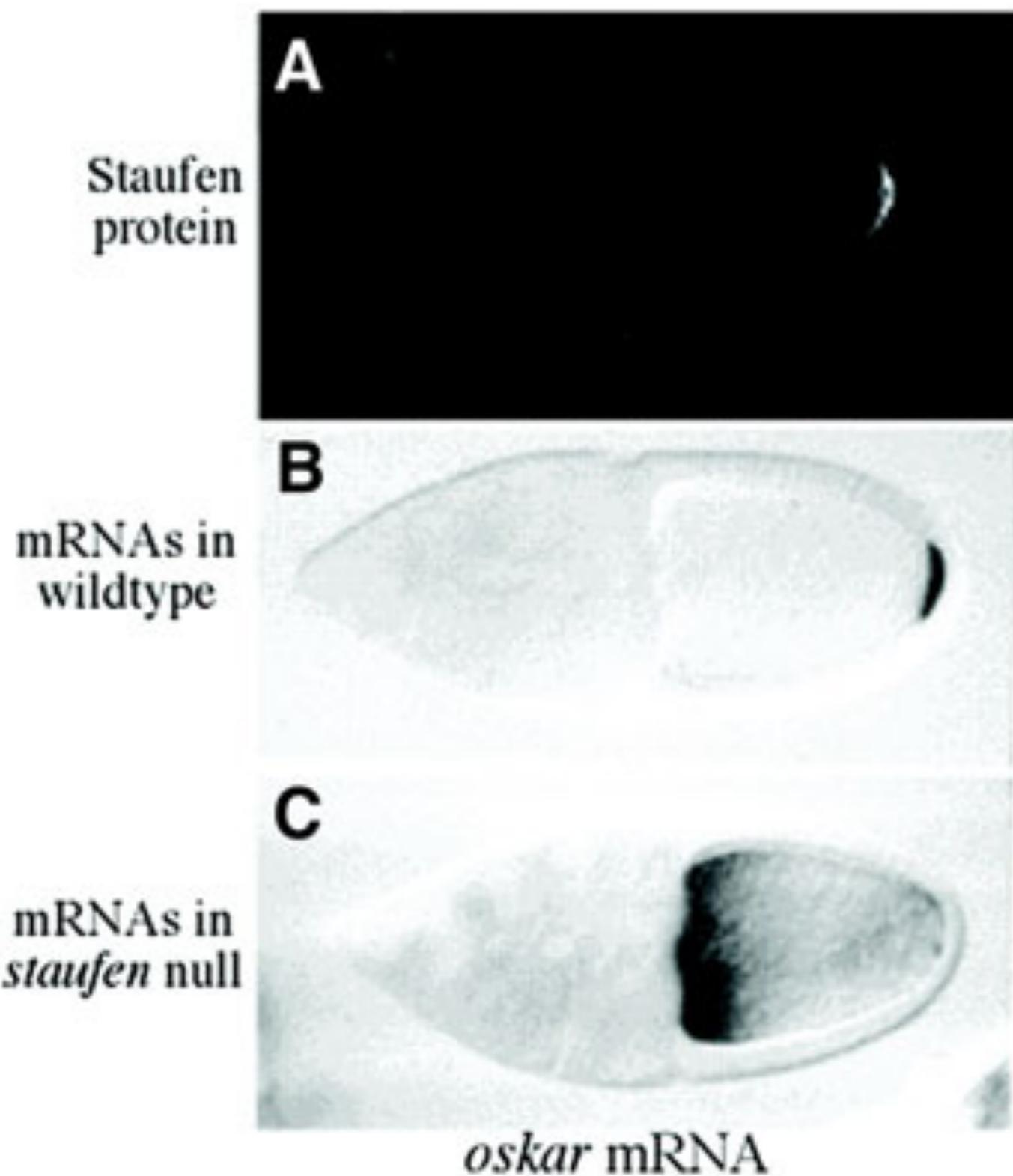
RNA localization systems: ASH1



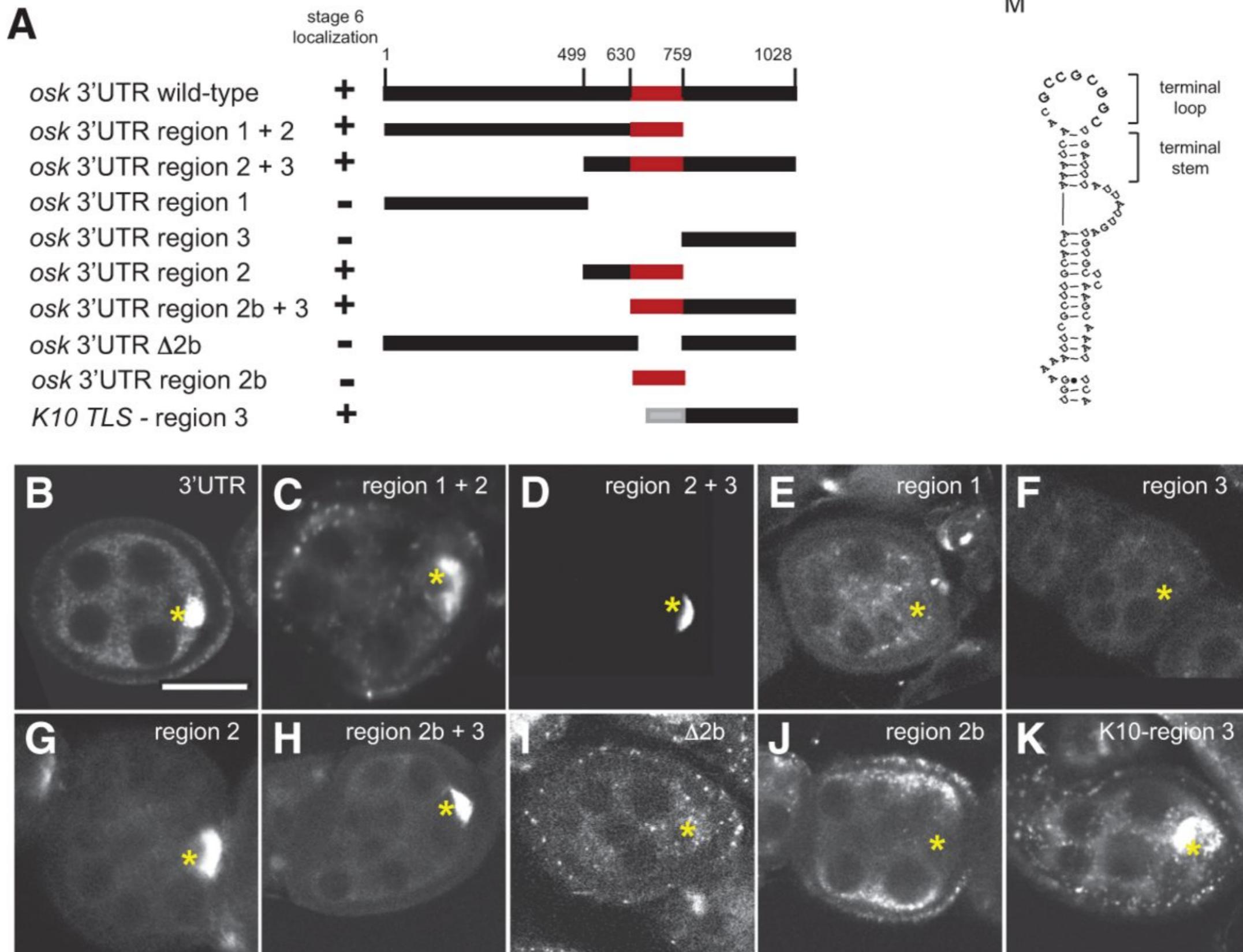
RNA localization systems: *oskar*



RNA localization systems: oskar

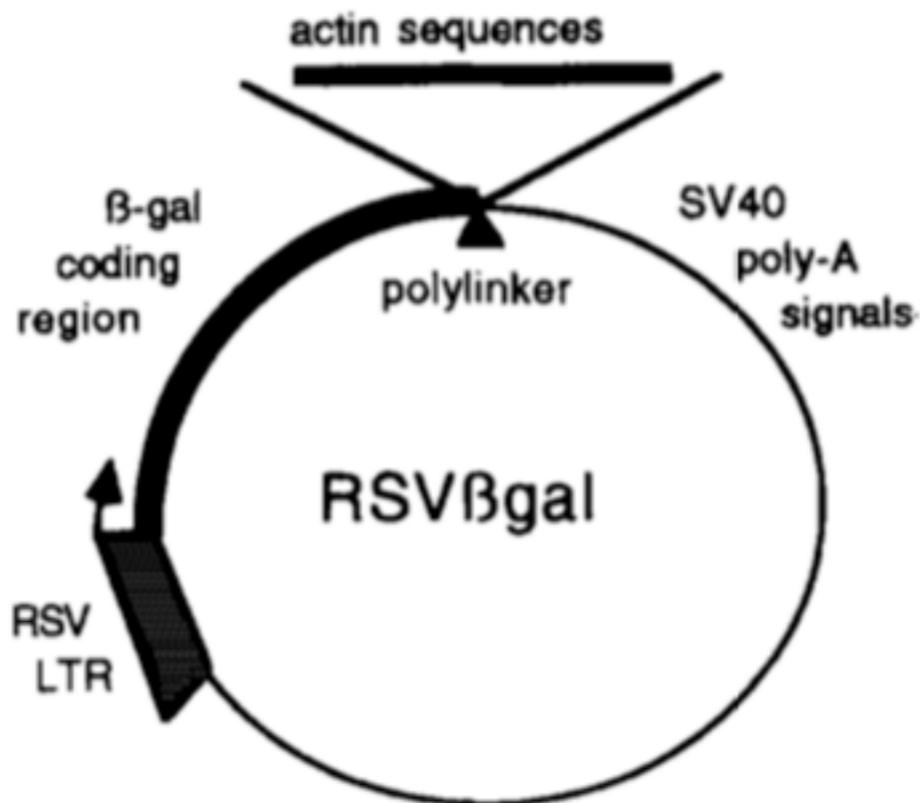


RNA localization systems: *oskar*

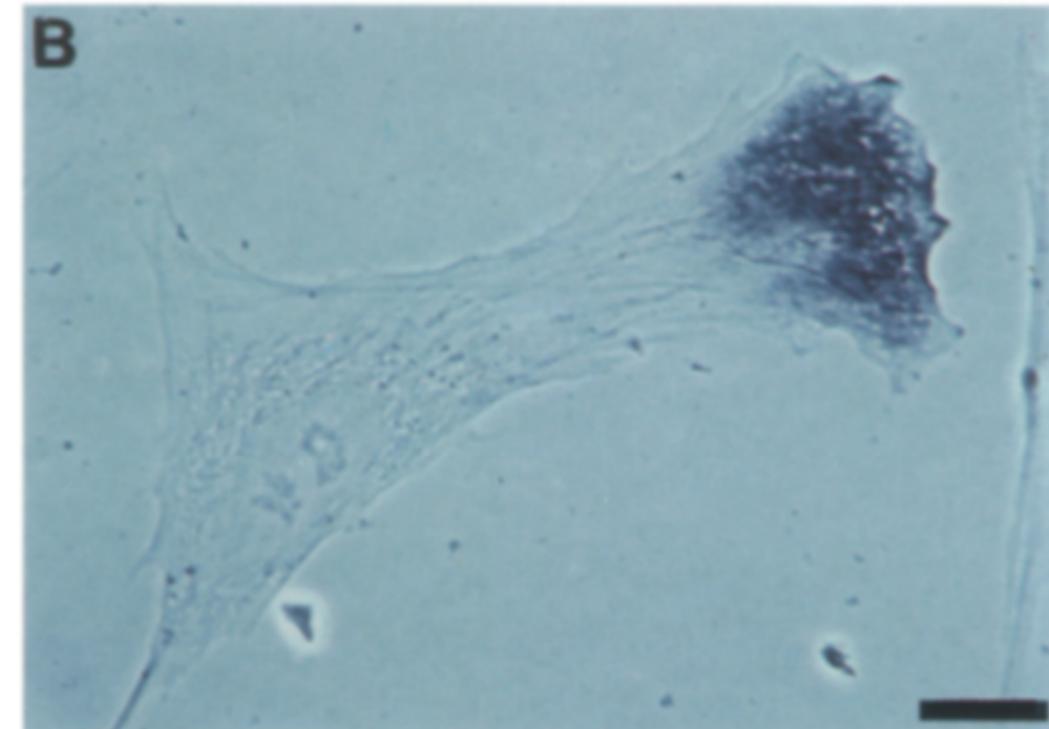


RNA localization systems: beta-actin

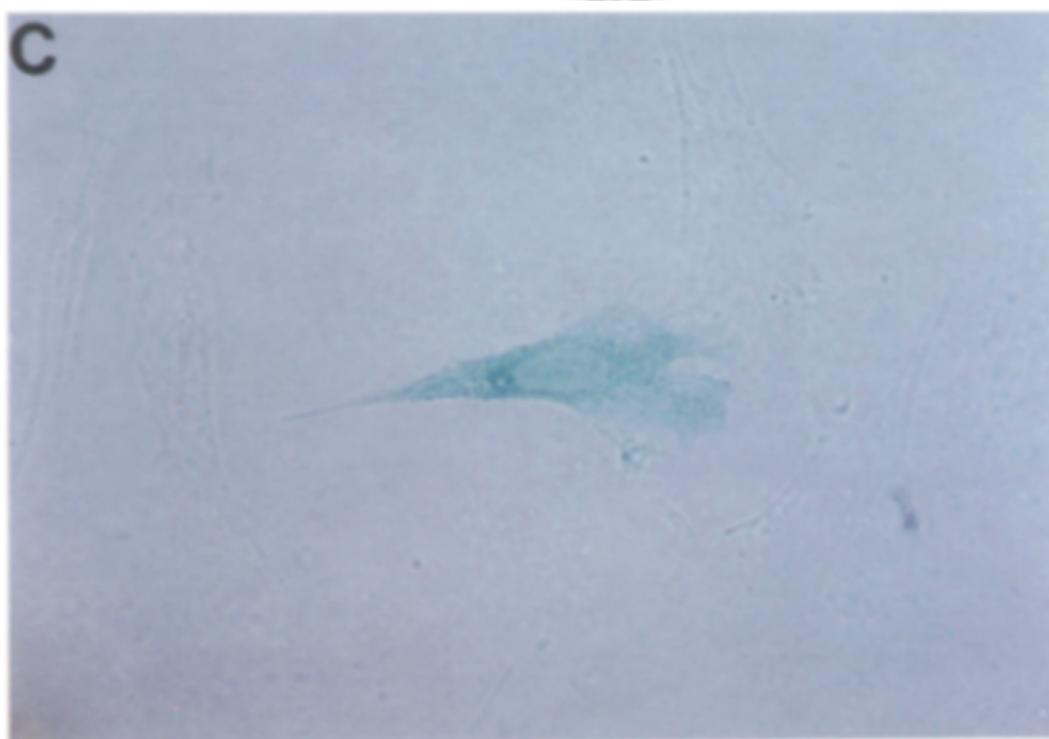
A



Endogenous beta-actin

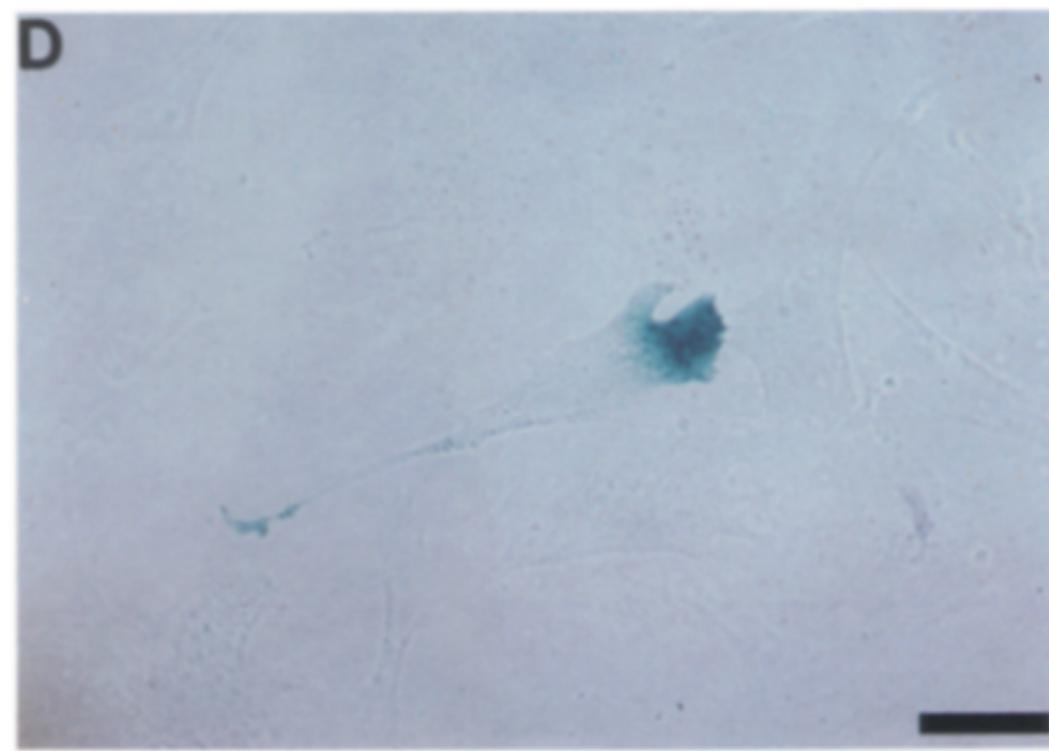


C



plasmid alone

D

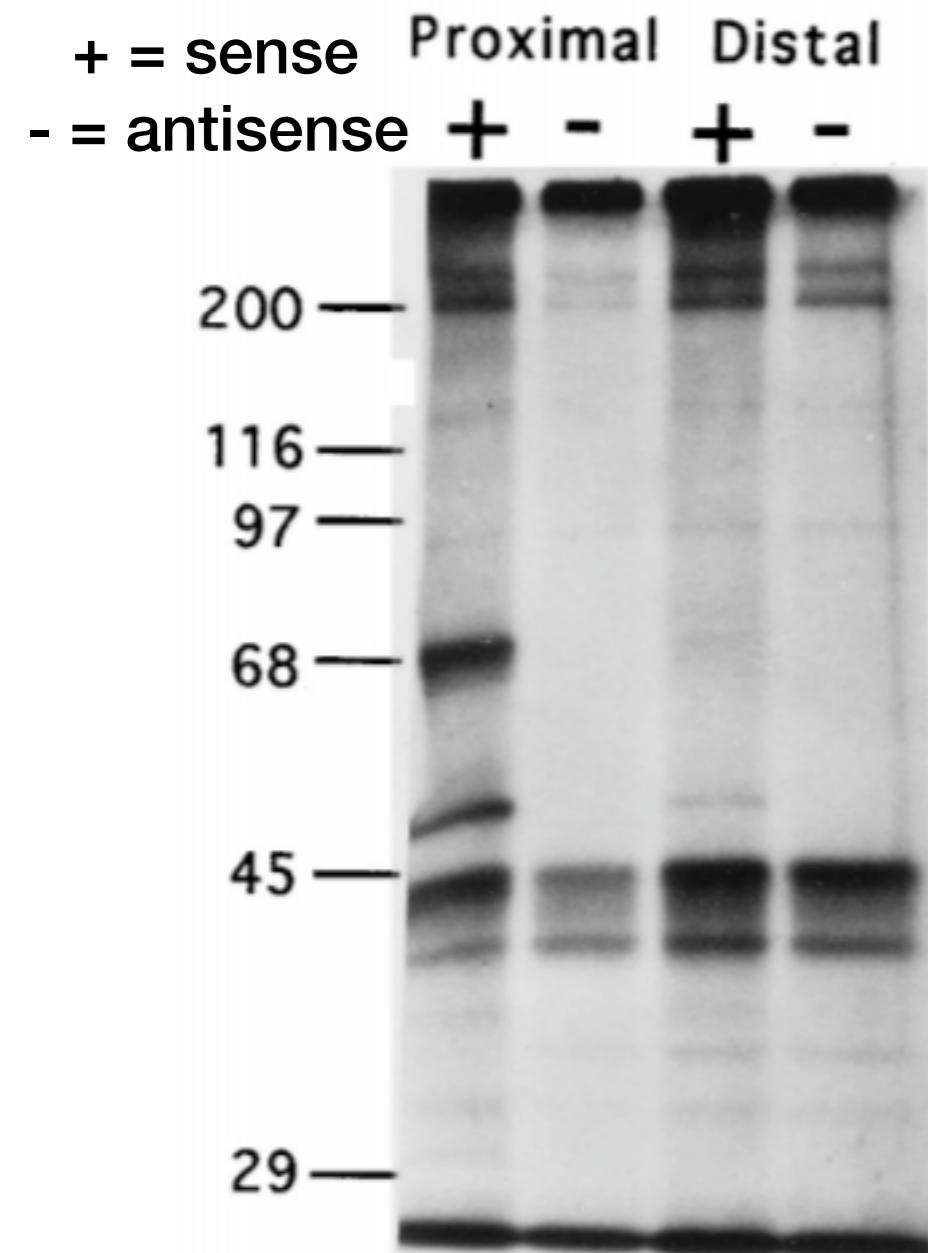


plasmid + beta-actin sequence

RNA localization systems: beta-actin

CONSTRUCT	INSERT	LOCALIZATION ACTIVITY	PERCENT (S.D.)
	no insert	-	5.6 (+/-2.2)
A	██████████	++	32.6 (+/-5.9)
B	██████████	++	29.4 (+/-4.0)
C	██████████	++	36.1 (+/-2.9)
D	██████████	++	36.1 (+/-4.1)
E	██████████	-	7.5 (+/-1.2)
F	██████████	++	33.0 (+/-5.1)
G	██████████	++	31.7 (+/-5.6)
H	██████████	-	9.5 (+/-3.2)
I	██████████	-	9.5 (+/-1.5)
J	██████████	+	14.1 (+/-2.6)
K	██████████	+ / -	10.6 (+/-1.8)
L	██████████	+	16.6 (+/-1.7)
M	██████████	-	4.8 (+/-2.0)
N	██████████ (inverted)	+ / -	11.3 (+/-6.7)
O	██████████ (31 nt deletion)	+	20.9 (+/-5.0)
P	██████████ (2 nt deletion)	+	17.9 (+/-6.9)
Q	██████████ (human)	++	28.0 (+/-6.8)

RNA localization systems: beta-actin



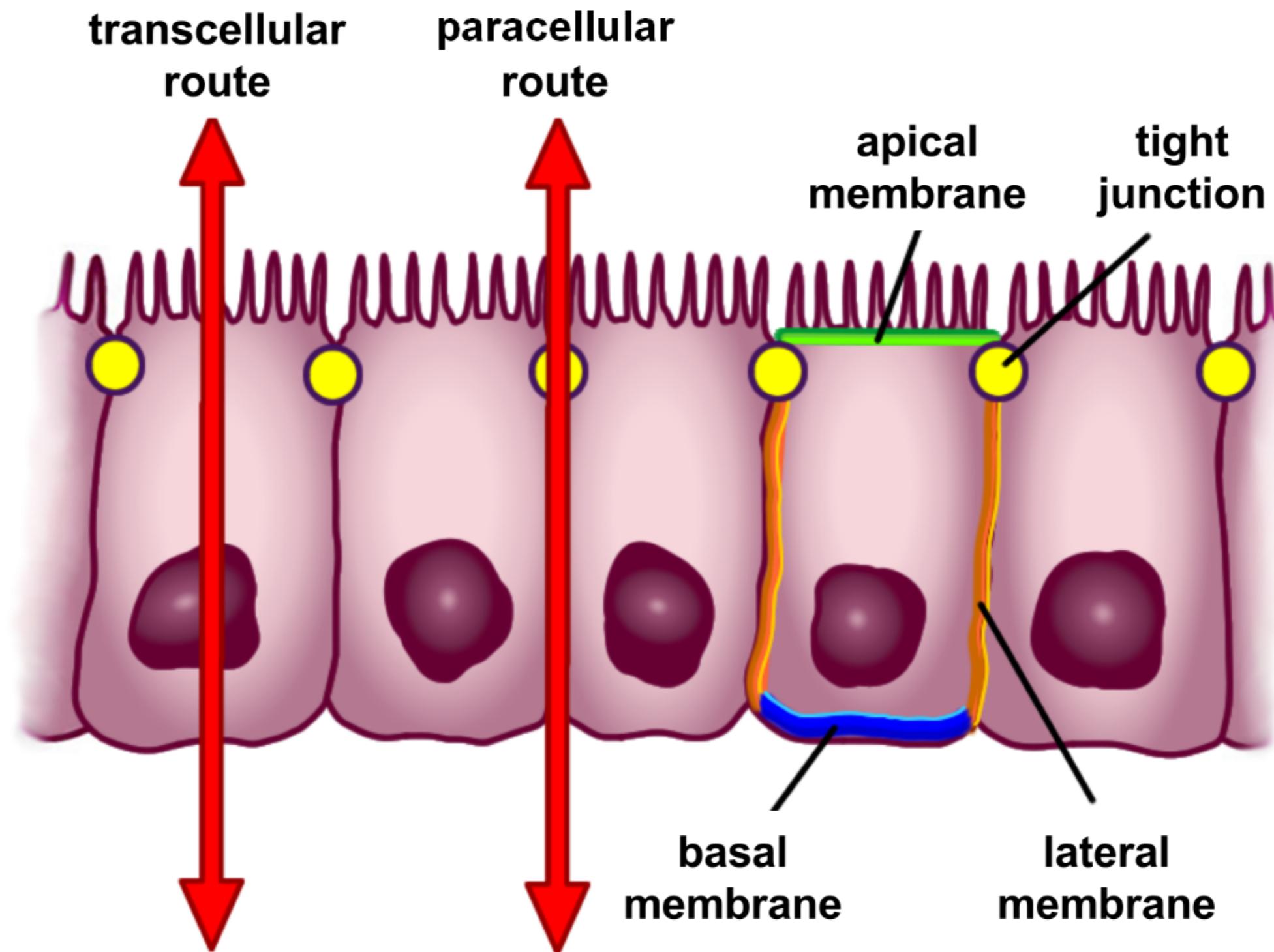
GFP-spinophilin 3'UTR

GFP-spinophilin 3'UTR ΔKH34 REs

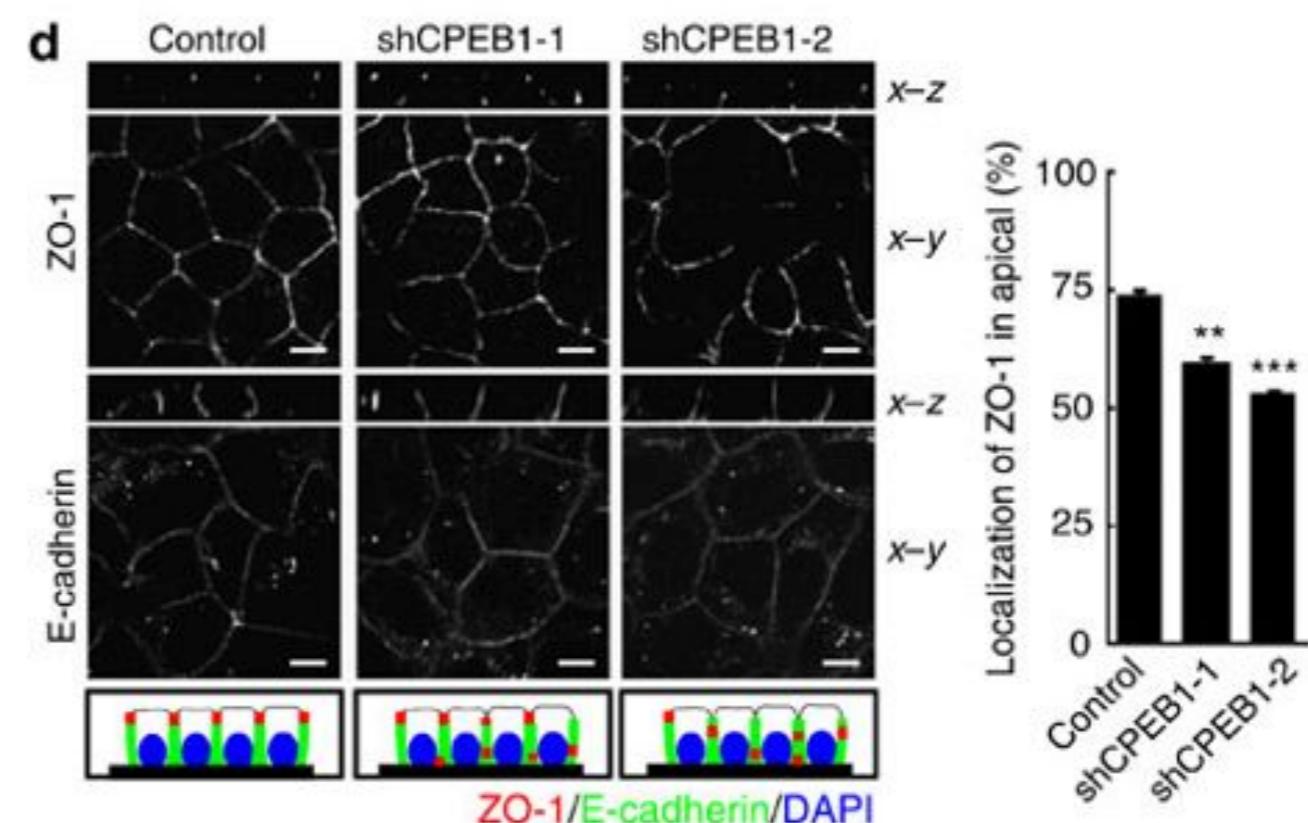
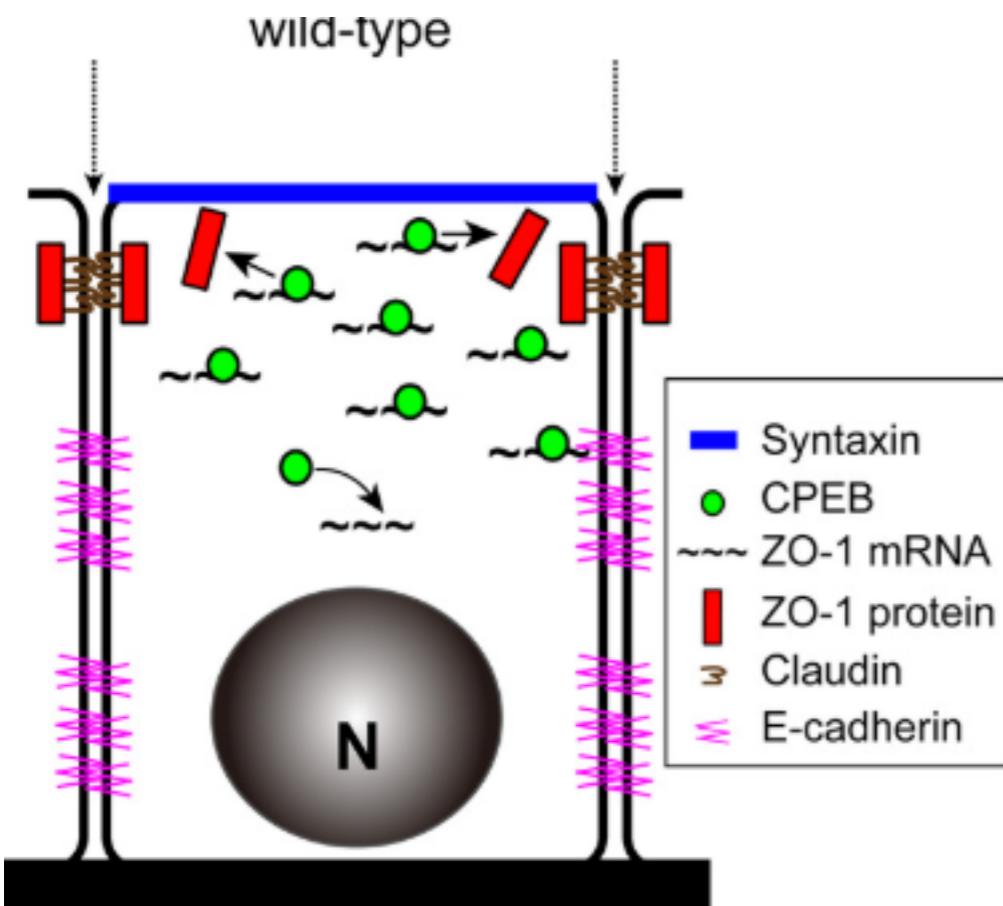
Ross et al (1997)

Patel et al (2012)

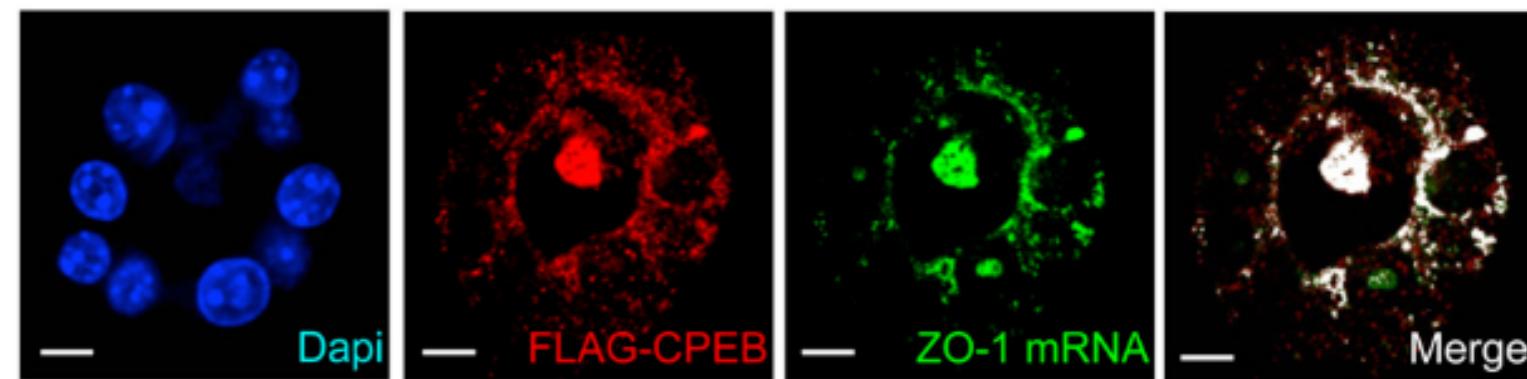
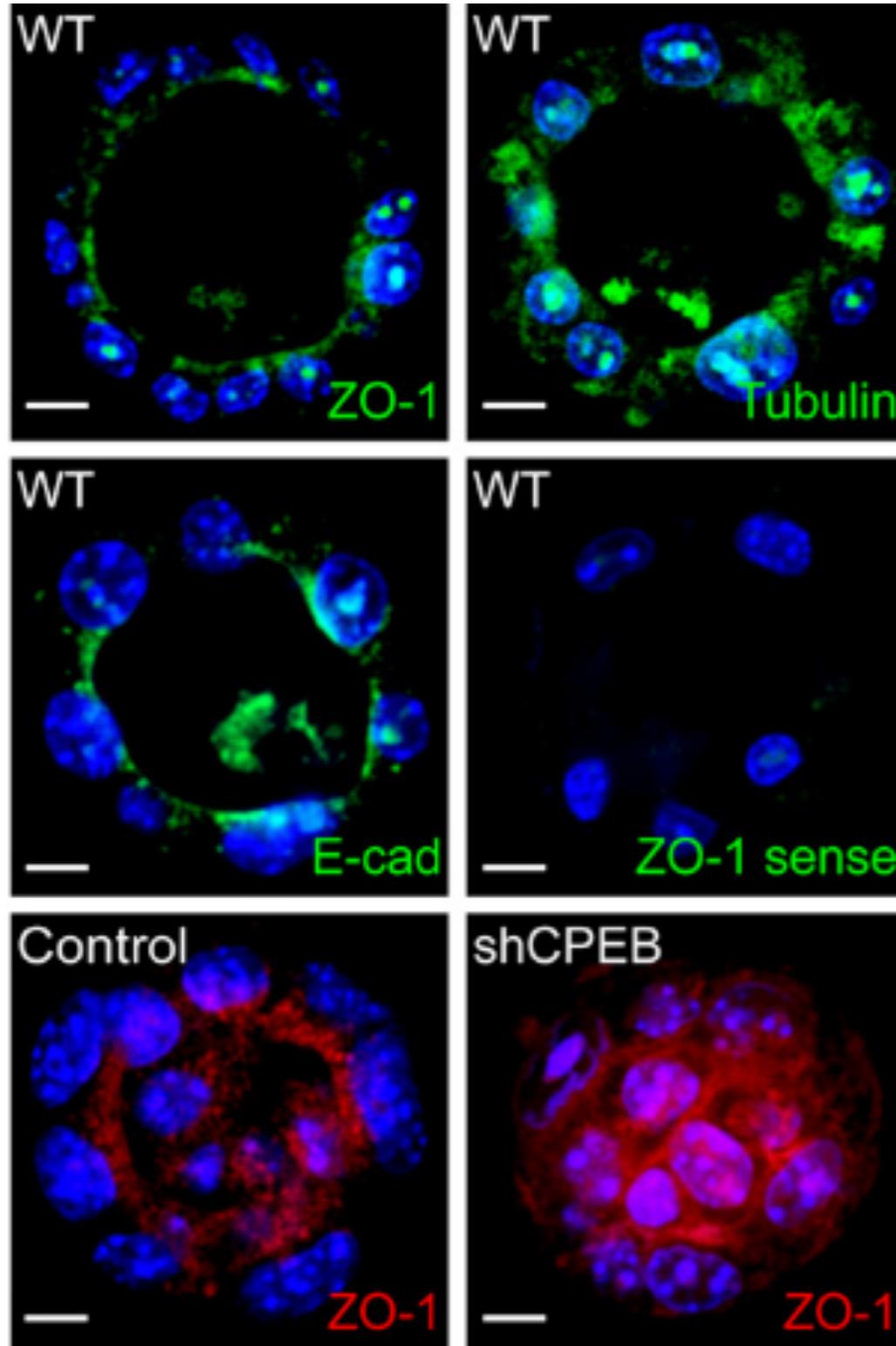
RNA localization systems: epithelial cells



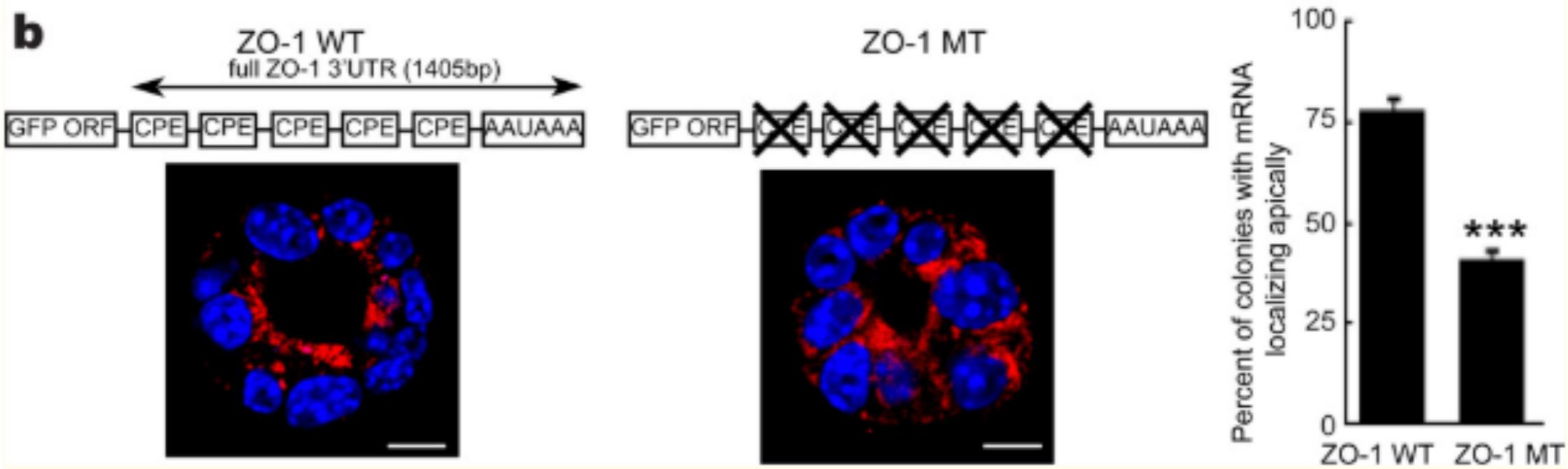
RNA localization systems: epithelial cells



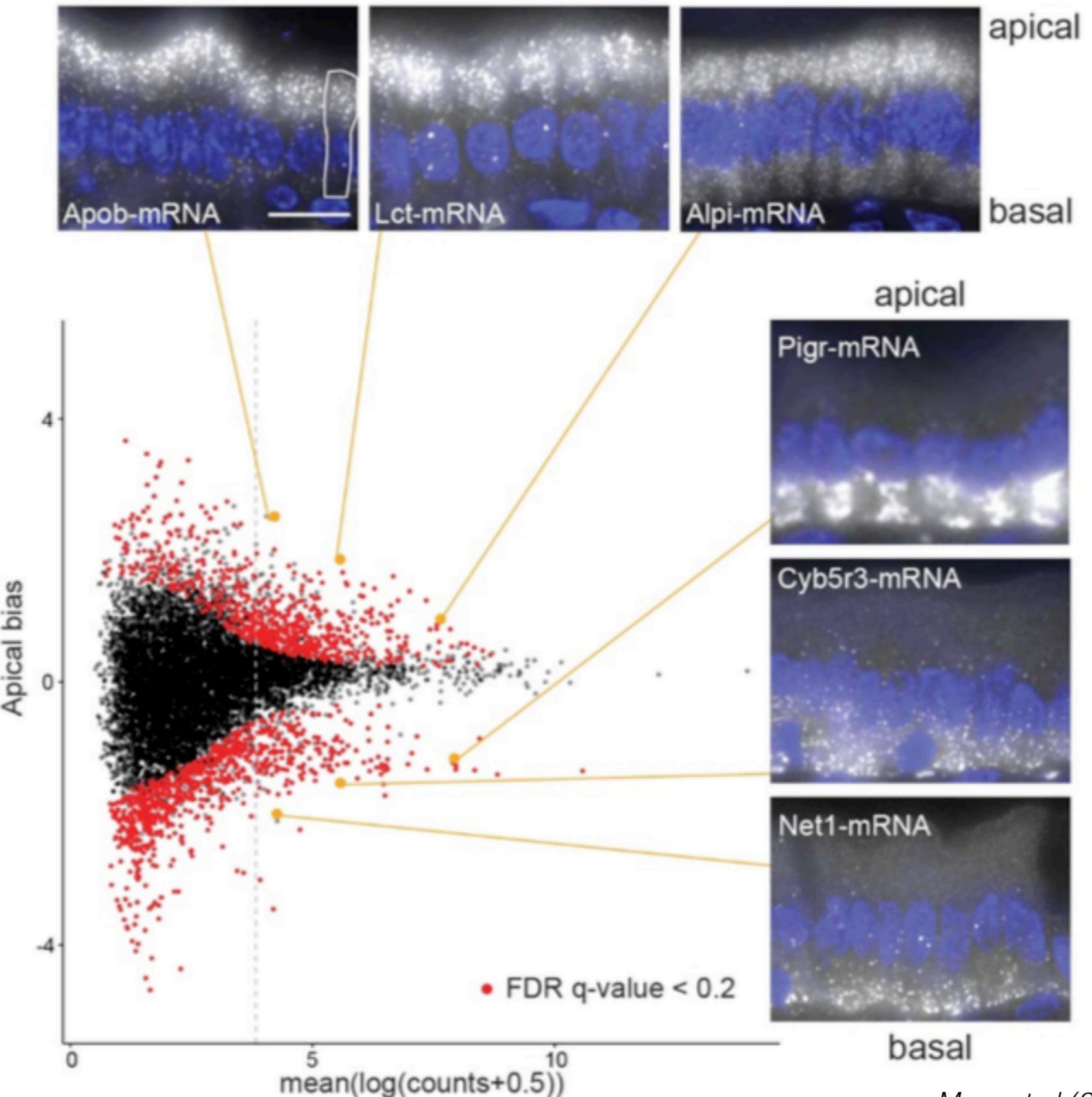
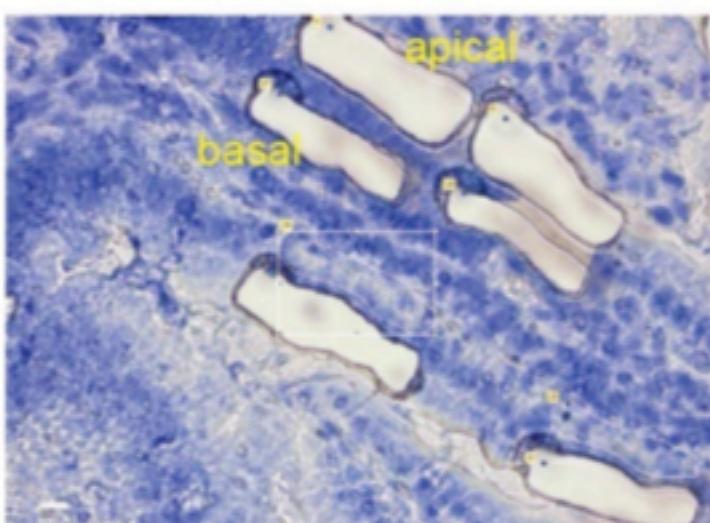
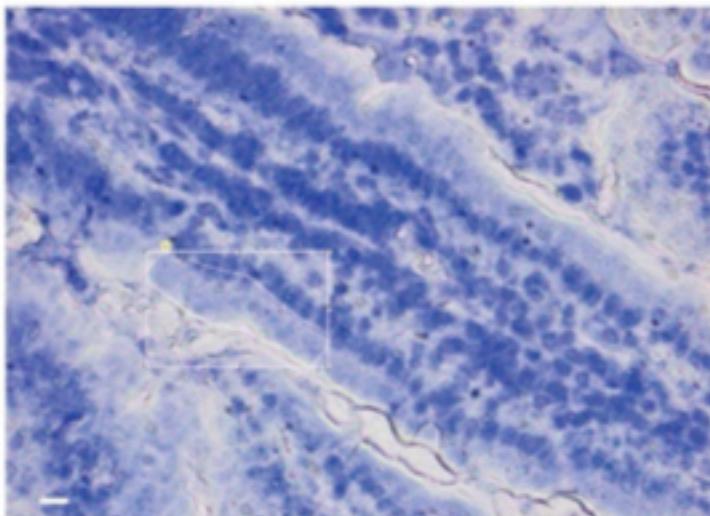
RNA localization systems: epithelial cells



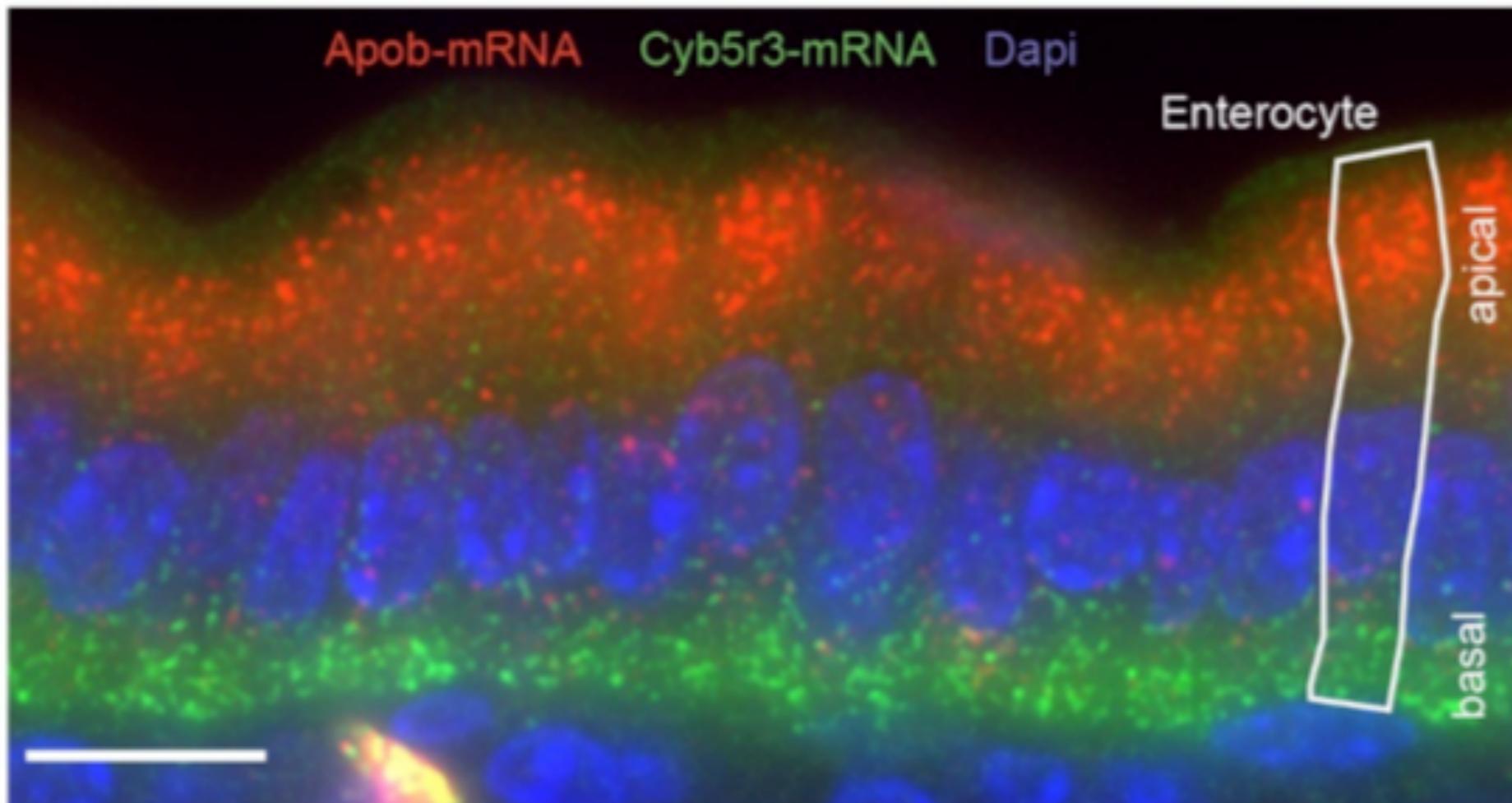
RNA localization systems: epithelial cells



RNA localization systems: epithelial cells



RNA localization systems: epithelial cells



RNA localization systems: epithelial cells

